ELECTRICAL CONTRACTING

DECEMBER, 1937

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With which is consolidated The Electragist and Electrical Record
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IMPACT...

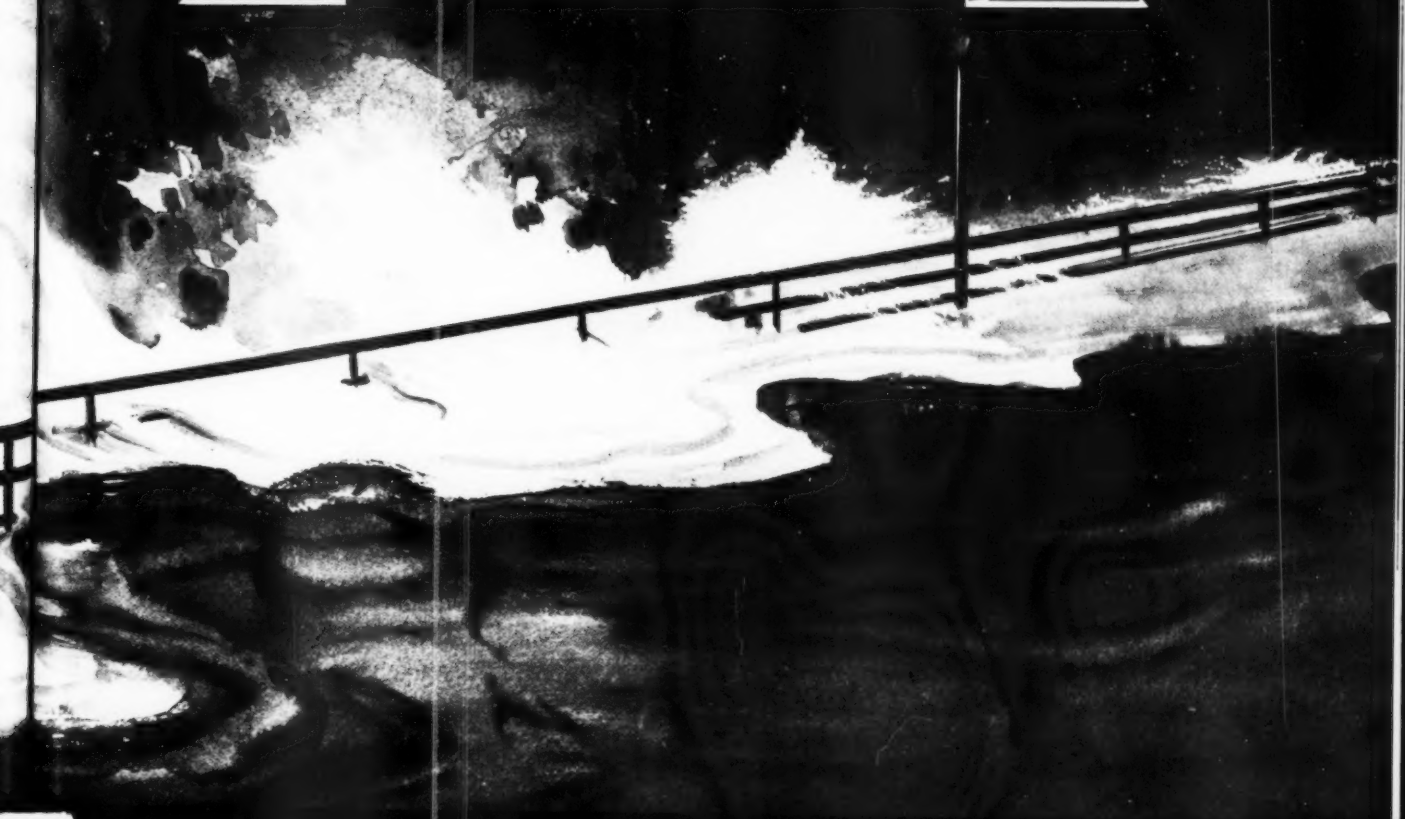
SEA-WALL STRENGTH is measured by ability to withstand the sledging shocks of ceaseless waves! Insulation, too, must possess an infinite capacity to resist smashing impact!

RESISTANCE TO IMPACT is an inherent characteristic of U. S. Tempered Rubber electrical wire and cable insulation. *Durability* is designed into U. S. Rubber protective coatings in the laboratory . . . built into them in the factory . . . and proved in hard service the world over. *Durable* U. S. Rubber insulation cuts maintenance costs . . . eliminates replacement problems . . . and offers a greater profit to the buyer or the seller of electrical conductors. Specify U. S. Rubber insulation for all electrical wires and cables. United States Rubber Products, Inc., New York, N. Y.

Wire is only as good as its Insulation

US

United States Rubber Company



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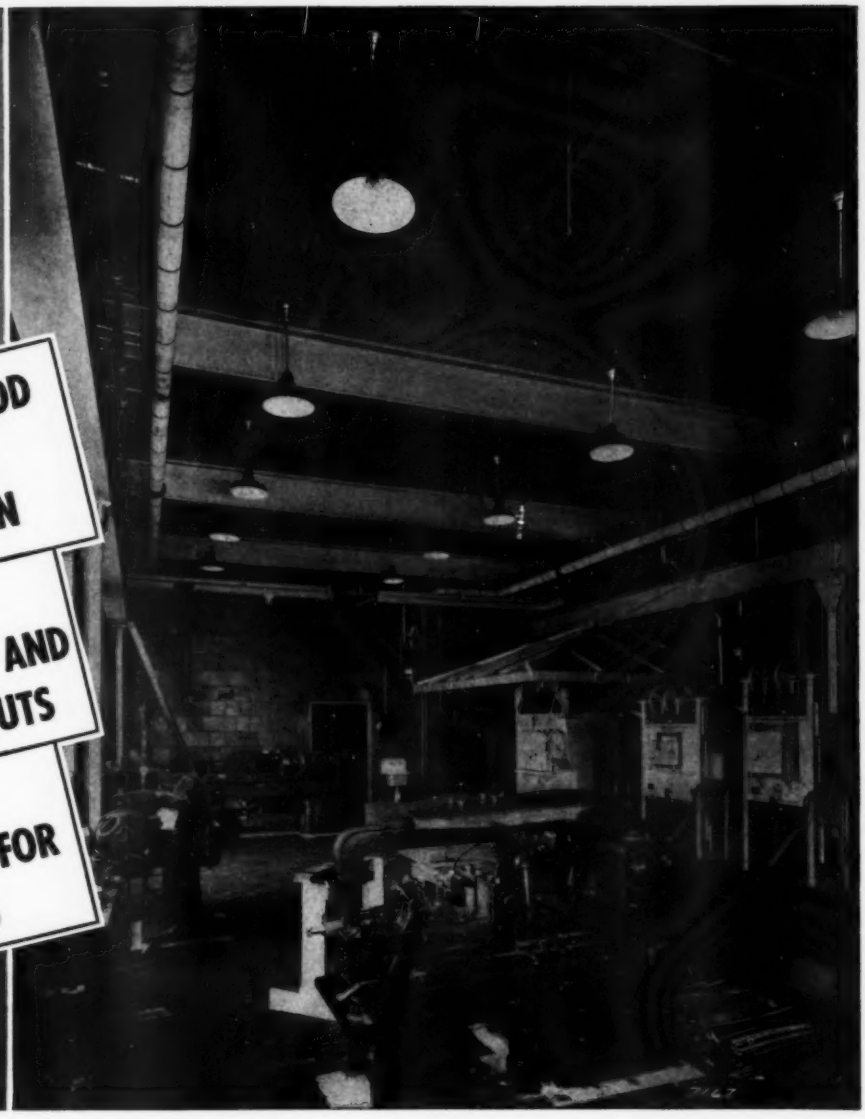
ROBERTSON STEEL FLOOR *was used throughout this new laboratory-office building built by a leading manufacturer. For this ground floor room, the flat steel underside of the floor above forms an attractive ceiling. Underside headers provide distribution for wiring requirements for ceiling lighting on this floor as well as floor outlets for telephone service on the floor above.*



A BETTER METHOD OF WIRING DISTRIBUTION

MORE COMPREHENSIVE AND FLEXIBLE LAYOUTS

LONGER ELECTRICAL LIFE FOR BUILDINGS

The Robertson Steel Floor *assures all three!*

THE Robertson Floor is made of hollow, parallel, steel cells. Each cell may serve as a runway for the distribution of wiring. Outlets can be cut in anywhere . . . over the entire floor area.

It is obvious that the unique electrical availability provided by the Robertson Floor makes possible far more comprehensive and flexible layouts. Its use also insures your customers' buildings against growing electrically obsolete before their time. In buildings where it has been installed, equipment may be moved or added with a minimum of trouble and expense, as new electrical needs arise.

You will readily appreciate the many outstanding features—both structural and electrical—that the Robertson Steel Floor brings with it. Our brochure "Wiring the Robertson Cellular Steel Floor" gives complete information, including layout and installation data. Write for your copy today! H. H. Robertson Company, 2003 Grant Building, Pittsburgh, Pennsylvania.

ROBERTSON STEEL FLOOR SYSTEM

UMI

ELECTRICAL CONTRACTING
DECEMBER, 1937

Help Wave This Shirt!

ON THE WAY TO THE CONVENTION and back, I indulged in a little personal coast-to-coast crusade. I stopped at eleven big cities, waving the bloody shirt for better wiring. The right men of the local electrical industry gathered and we had a bit of rousement. We took this wiring situation apart and looked it over.

WE FIGURED OUT HOW MANY BUILDINGS there are in each town—industrial, commercial, domestic—now under-wired. We considered how this is curtailing and depressing all branches of the electrical business. We took our hair down. We faced the fact that soon the public will find out how its money and comfort are wasted by tight wires.

WE AGREED AMONG OURSELVES that we can't turn our backs on 22,000,000 customers. We know that General Motors or Montgomery Ward or somebody will step in with a national wiring chain and grab the market. And if they wire homes, they will wire stores—and more.

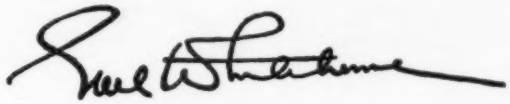
RIGHT THERE SOMEBODY ALWAYS SAID—"What'll we do?" And of course, the way is clear. A few of the strong contractors in each city must organize re-wiring departments and handle this work with mass production methods—1,000 jobs a month—by each. The selling must be done jointly by the power company, wholesalers, manufacturers and these contractors, with a hard hitting sales crew and powerful publicity, under able campaign management.

OBVIOUSLY YOU CAN'T BRING EVERY CONTRACTOR into this kind of an operation. Only men with financial responsibility, organization, equipment, experience, capacity and courage can take it on. It is a job for the larger contractors who normally do industrial and commercial work. But on this basis they can wire homes at low cost—with profit.

MEANWHILE THE CURBSTONERS will take their tools and get a safe, steady job on the payroll of the re-wiring group. And the small qualified contractors will be busier than ever on the growing general work stimulated by the big drive.

THESE MEETINGS WOUND UP WITH A CHALLENGE to each local industry to get going. And in every city men declared that they would set to work on it. In many cases plans were started right then.

WHAT WILL COME OUT OF IT? God knows! But it does show that this critical emergency exists in every city—and that electrical men do see the urgent need when they think of it. And I am still young enough to believe that electrical men will face these facts to save their own skins.



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THE WORLD'S BEST PROSPECT FOR A REWIRING JOB

may not know an outlet from a circuit!

THE first step in selling a rewiring job is to educate prospects on the *need* for adequate wiring.

That's what our booklet, "The Key to Better Living," does for you. Addressed to your customers, it explains in plain everyday language the mysteries of house wiring and its relation to the convenient use of lighting and appliances...stresses the difference between adequate and inadequate wiring. We have a plan for distributing imprinted copies of the booklet to your customers. You'll want to know about it. Your name on the coupon below brings you the details.

This booklet can help you educate, interest, sell

Room 1553, Graybar Building, 420 Lexington Avenue, New York, N. Y.

Gentlemen: Please send us full information about your booklet, "The Key to Better Living."

EC-12-37

NAME.....

ADDRESS.....

CITY.....STATE.....

GraybaR

OFFICES IN 83 PRINCIPAL CITIES

J. G. SPAULDING—*One of the pioneers in motor shop practice.*

ROLLER TRANSPORTATION — *This rewound motor is going to the test cage for a "short commercial" test before delivery.*

LINE PRODUCTION FOR MOTOR REPAIRS

A Detroit Motor Shop Adopts Line Methods of the Auto Industry for Speedy Production

LOCATED in the heart of the automotive industry, the Spaulding Electric Company of Detroit is meeting demands for better motor repair work and service by adopting the line production technique of its principal customers.

The company was formed in 1910 to serve the rapidly growing automobile plants at a time when it was customary to return burned out induction motors to the factory for repair. James Garfield Spaulding decided to take over this work, by giving prompt service at a reasonable price as a specialist in the needs of this rapidly growing industry. By 1929 this company's facilities had become taxed to the point where prompt service, the thing that had built the business was no longer so prompt. Something had to be done, and quickly.

"Jim" studied the methods of his customers. He installed specialized tools, modern material handling equipment, new machine tools, testing equipment, cost control systems and other modern aids to production and management. He made a roller conveyor system for the production line a key feature of this shop's facilities. It all took more than two years to install.

Let's take a trip through the repair shop, behind a defective 10 hp. motor. It has just been lifted, still hot, off the truck by an electric hoist and deposited on the gravity roll conveyor which leads into the test department. Here it is rolled into "test," nameplate data is recorded and a job number assigned. All this is done with a minimum of handling effort.

Testing and Cleaning—The motor data is sent directly to the main office through a tube system and placed in the job file. A job sheet is then made out for the work and sent back to the test station. In the meanwhile the motor has been tested and taken down, the rotor, end shields and small parts are loaded into a tote tray and rolled on into the cleaning booth. Solvent under 300 lbs. per sq. in. pressure removes all grease and dirt before the dismantled motor goes to the shop. Stator and tote tray are tagged with the job number and carried to the second floor where the stator starts down the winding shop roller conveyor. The rotor, end bells and small parts are routed through the mechanical repair shop.

Winding—The first station on the winding department conveyor line is a stripping booth. Here the stator coil insulation is burned out with a gas torch and the old coils are pulled. Winding data is taken, connections noted and the data sent to the shop office where a coil winding specification card is made out and checked with the standard data. Coil specifications are then returned to one of the girls operating the coil winders, where a sample coil is made up, taped and formed. As a final check the sample coil is fitted in the stator, and checked against the specification. The coils are then completed.

During the coil winding time the stator has gone through a bath of fine flint shot under high pressure to remove all remaining particles of insula-

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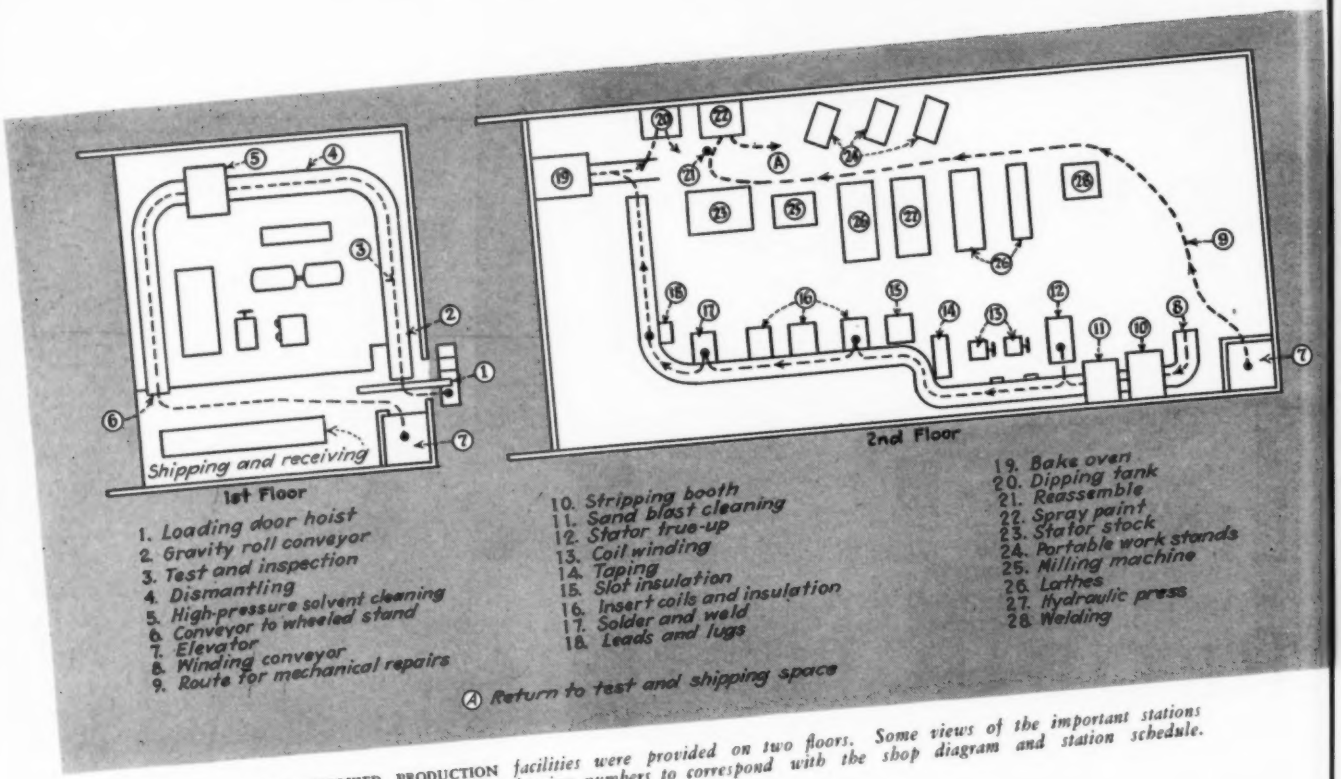
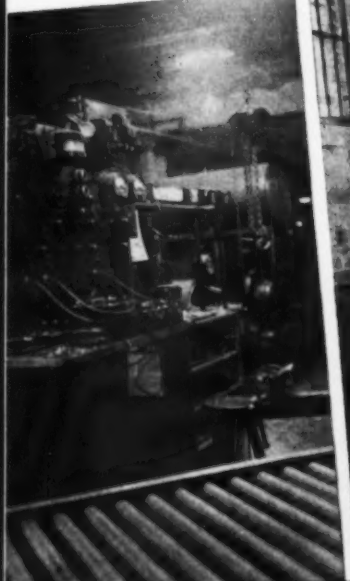


CONVEYORIZED PRODUCTION *facilities were provided on two floors. Some views of the important stations along the line appear below, bearing numbers to correspond with the shop diagram and station schedule.*

FIRST STOP—*The test board is the first station on the conveyor line. Reports are sent to the office through a tube system.*



DISMANTLING STATION — *Motors are taken apart for cleaning, other operations following along the conveyor line.*

ROLLING THROUGH *this solvent cleaning booth, motor parts leave dirt and grease behind and make the next man's job easier.*

GOING UP *with parts checked, cleaned and tagged at conveyor stations, they are now taken to the next floor.*

tion or varnish, and slot insulation has been cut ready for the coils. Further down the conveyor line the bare stator, coils and insulation are slid off onto a make-up bench where the coils are laid into the stator. At the next station all joints are completed and new leads and lugs installed. Joints are either brazed, welded or silver soldered.

Finishing—After dipping and baking the finished stator is joined by the rotor and end bells which have been repaired in the mechanical section. A 150-ton hydraulic press removes worn shafts and presses in new ones. When shafts can be built up economically by welding, a battery of lathes and milling machines are prepared to handle the finishing work. The parts are reassembled and spray painted.

Before being returned to the customer, however, the rewound motor is again placed on the test line for a "short commercial" test. The d.c. resistance is measured, then follows an excitation test, which tests the stator. An impedance or locked rotor test is made, and finally a high voltage insulation test to ground. Where motor characteristics require, a dynamometer test is made of the speed and torque.

Stock Handling—Back of all this production line activity is a well equipped and organized stock department. On the third floor of the building a stock clerk keeps in touch with shop needs through a direct interconnecting telephone and a tube system. Wire reels are handled by "remote control" up in the stock room. On an order from the winding department the wire is selected from stock, weighed and mounted on a payout rack. The ends are fed through a ¾-inch seamless tube to the winding station below. When the job is completed the coils are weighed and returned to stock, the difference in weight being charged out to the job.

A perpetual inventory card system is maintained and keyed by number to the storage racks and bins.

The Spaulding Electric Co. was among the first motor shops in the country to maintain a stock of spare stators to permit emergency repairs at regular rewind prices. The burned out stator is replaced from the spare stator stock in a few minutes. The rewinds can thus be routed on the regular production line, and returned to stock for the next call. Customers get all these benefits, and the shop is not disorganized with rush jobs. Pioneering is all in the day's work for this shop, however, and when new methods are developed, they will be found among the first to adopt them.

WIRE PAYOUT REELS *are in the stock room. Ends are fed from reels through tubes to winding stations on the floor below.*

NG STATION *where insula- burned out with gas old coils pulled and stator to a sand blast booth.*

WINDERS HANDLE *no reels. Wire feeds through a tube from reels in upstairs stock room to wire tension devices.*

STATOR, COILS *and slot insulation arrive together on the conveyor. Overhead tramrail transfers larger stators to the benches.*

CONVEYOR TERMINATES *at the oven where rewinds are dipped and baked ready for assembly and spray painting.*

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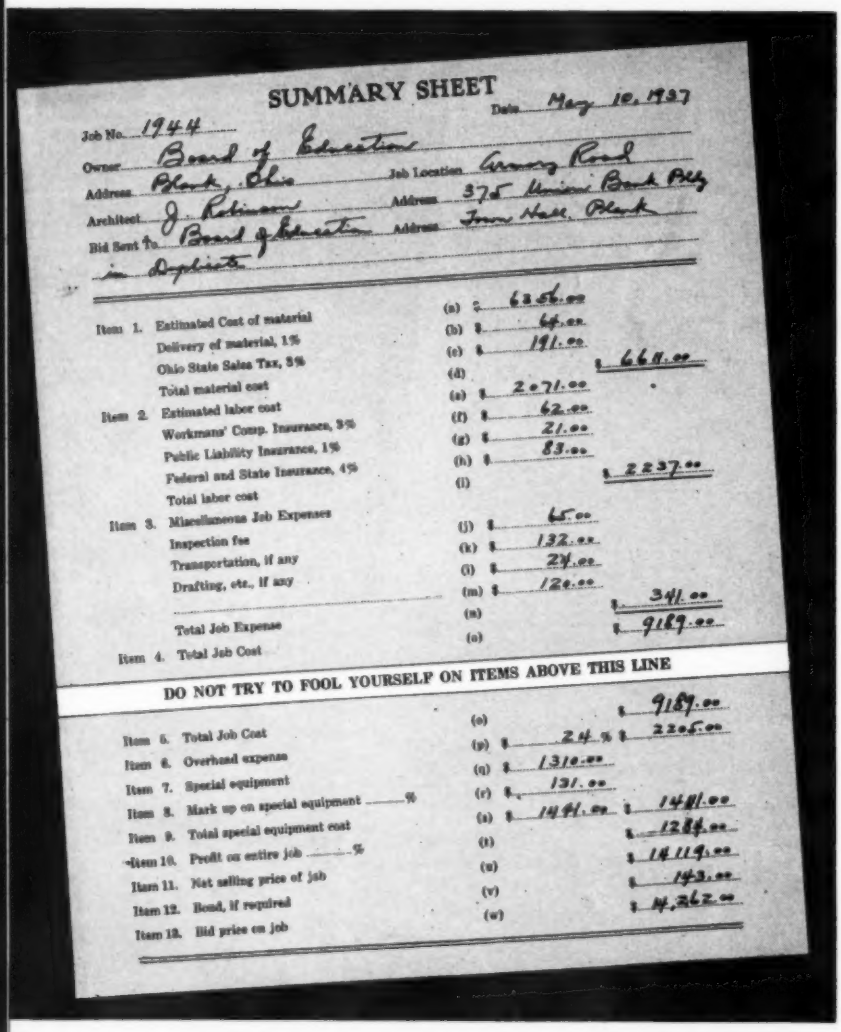
Toledo Clarifies BIDDING



SUMMARY SHEET

Date May 10, 1937

Job No. 1944
Owner Board of Education
Address Plank, Ohio
Job Location Armory Road
Architect J. Robinson
Address 375 Union Bank Bldg
Bid Sent To Board of Education
Address Town Hall, Plank
in Duplicate

Item 1.	Estimated Cost of material	(a)	$ 636.00	
	Delivery of material, 1%	(b)	$ 64.00	
	Ohio State Sales Tax, 3%	(c)	$ 191.00	
	Total material cost	(d)		$ 891.00
Item 2.	Estimated labor cost	(e)	$ 2071.00	
	Workmans' Comp. Insurance, 3%	(f)	$ 62.00	
	Public Liability Insurance, 1%	(g)	$ 21.00	
	Federal and State Insurance, 4%	(h)	$ 83.00	
	Total labor cost	(i)		$ 2237.00
Item 3.	Miscellaneous Job Expenses	(j)	$ 65.00	
	Inspection fee	(k)	$ 132.00	
	Transportation, if any	(l)	$ 24.00	
	Drafting, etc., if any	(m)	$ 120.00	
	Total Job Expense	(n)		$ 341.00
Item 4.	Total Job Cost	(o)		$ 9189.00

DO NOT TRY TO FOOL YOURSELP ON ITEMS ABOVE THIS LINE

Item 5.	Total Job Cost	(o)		$ 9189.00
Item 6.	Overhead expense	(p)	$ 24 %	$ 2205.00
Item 7.	Special equipment	(q)	$ 1310.00	
Item 8.	Mark up on special equipment ____%	(r)	$ 131.00	
Item 9.	Total special equipment cost	(s)	$ 1441.00	$ 1441.00
Item 10.	Profit on entire job ____%	(t)		$ 1284.00
Item 11.	Net selling price of job	(u)		$ 14119.00
Item 12.	Bond, if required	(v)		$ 143.00
Item 13.	Bid price on job	(w)		$ 14,262.00

CHECK SHEET—*Bidding form used in Toledo to bring out uniform job costs.*

Bugless Bid Makeup Helps Smooth Functioning of Voluntary Code

THERE is no occasion for confusion or misunderstanding about bid makeup procedure among the 32 members of the Toledo Electrical Contractors Association. They use a fool-proof summary sheet form for making up their bids. This form clarifies all the odds and ends of job costs, that must finally be added to a basic estimate of labor and material costs.

Ever since the suspension of NRA, the Toledo contractors have operated under a local voluntary code of fair competition. So they worked out an orderly procedure for getting all bidders on a uniform basis of figuring taxes, insurance, job expense and other items. This has been a great aid to maintaining harmony. As a result, the bid depository system functions smoothly, a part of the voluntary code procedure on all jobs of $100 or more.

According to Clarence F. Hammer, full-time secretary of the Toledo association, the contractors have learned to use their summary sheets to good advantage in dealing with their customers. Since they have nothing to hide, the existence of the local voluntary code is generally known. Their bid depository is the local office of the Better Business Bureau. In any discussion of bid prices with an architect, builder or owner, the members do not hesitate to produce their bid make-up or summary sheets for analysis. They also use the summary sheet to explain costs, and to clarify T & M or cost-plus agreements.

The form itself is highly valued, because it has brought together all the elements of a complete bid, for quick checking and review. Each bidding member makes out these forms in duplicate, keeps the white original, and sends the yellow carbon copy to the bid depository, together with a copy of the bid letter or proposal form. Within 24 hours after the closing time set for taking bids, these duplicates are available for tabulation. In case a protest arises about the bids on a job, the proper committee has a clean-cut record of all bids available for analysis.

On the summary sheet reproduced here, a hypothetical bid has been worked out as an example of the way the form is used. Item 1, "Special Equipment" is intended to cover any costly special items, such as transformers, motors and controls or large switchboards, to which it would not be advisable to apply regular percentages of mark-up.

Many contractors and association groups are complaining about the complications that exist in bid making as new taxes and insurance requirements become a part of the contractors operating and job costs. Here then is a way out. This procedure is useful, not only for association groups who seek a means to bring about uniform practice. The individual contractor also finds this summary form a time and money-saver.

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RURAL INSPECTION

A talk presented before the Eastern Section of the International Association of Electrical Inspectors in Hartford, by G. D. Munger, Director, Utilization Division, Rural Electrification Administration

BY setting up the REA, the President moved America's electric clock ahead many years. Rural electric line construction had practically stopped. Because of a subdivision of farms, in many areas there was actually a new increase in the number of farms without electric service. To change this situation, REA is lending money to finance the entire construction cost of new lines in previously unserved areas, and is encouraging and facilitating the use of private funds for rural line extensions.

Under that stimulation private utility companies recorded a record year in farm power extensions in 1936, and 1937 reports indicate a considerable increase over last year.

The direct lending program has resulted in $73,728,210 lent or earmarked up to September 7, 1937 for 325 separate projects in 41 states. These projects will, when completed, add some 75,000 miles of new rural lines and provide central station electric service for nearly 250,000 rural customers. Some of the funds are being used for generating facilities, and some for financing installations of wiring and plumbing in farms and rural dwellings. Projects totalling $57,714,357 have been submitted to the private contracting industry for competitive bids and construction contracts approved for $51,501,284. Most farmers want electric service.

The Vital Factor

Obviously, the first step to the efficient and abundant use of electric current on a farm is a safe, well done and adequate job of wiring. It must be intelligently planned to meet present and future needs of the individual farmer. Following that, there should be the best job of inspection that is obtainable anywhere for every farm, whether it is served by a line constructed with the aid of government financing or not.

There are comparatively few states that have laws requiring inspection of wiring in rural areas. One of our jobs is to see that every state has the proper kind of inspection laws, that give protection to every house and building wired for electricity.

Too many people all along the line in the development of a rural electrification project think in minimum terms. But in a comparatively few years I believe there will be developed new uses, and new equipment for farm use, which we do not see at the present time. Then, too, we should remember that families grow, and herds grow, as do human needs and desires.

GEORGE D. MUNGER

Of all the groups interested, the farmers themselves, as a rule, know the least about electricity. Light, of course, is given first consideration. Beyond that, few think of electric service except in terms of a very few minor appliances, and there seems to be a lapse in the thinking of these people when it comes to wiring. The cheapness of the wiring job means more than its safety and adequacy. Little thought is given to the fact that electric energy cannot be put to widespread use unless the means are provided by which it can be released from the wires that conduct it.

But every farm should be wired to carry current to any piece of equipment that will save time and labor. So there is an immediate need to bring to farm groups all over this country knowledge of wiring, safe and adequate, and well and systematically inspected. Let me tell you what REA has done in this particular field.

A manual has been worked out on wiring and plumbing procedures. The specifications in the manual have been drafted as a definite requirement for all installations financed with funds borrowed from REA. In the interest of securing safe wiring installations within a project, REA has requested that these specifications be adopted to guide the quality of materials and workmanship for all installations regardless of whether they are financed by REA funds, private funds, or on a cash basis. These specifications embody the regulations of the National Electrical Code.

REA has a financing plan enabling project sponsors to borrow money for the wiring of farmsteads. These loans enable farmers to install wiring and plumbing on their premises without waiting to harvest and market their crops. This loan may include money for water pumps and complete plumbing installations. These can

(*Continued on page 78*)

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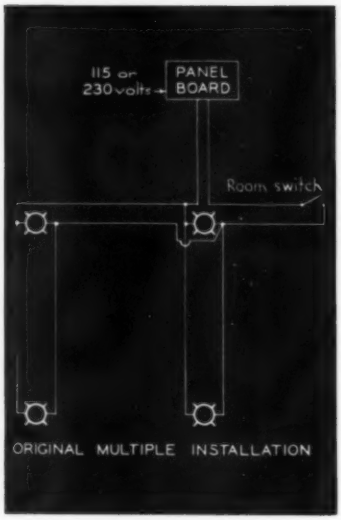

Wire Capacity D

Three wire circuits in same conduits now carry double load

in the Nela Park office buildings

CHECKING THE PLUS AND MINUS

System A. 220-Volt Series

ADVANTAGES	DISADVANTAGES
1. Permits the use of 115-volt lamps, which are less expensive and more efficient than the 230-volt lamps required for System B.	1. When one lamp burns out two outages result because of the series burning. 2. The pairing of outlets, to wire two in series, is not always simple. Difficulty occurs when there is an odd number of outlets. 3. Lamps of equal wattage must always be used in the two sockets wired in series.

NOTE:—The disadvantages of this system when used for a number of private office spaces, corridors, stockrooms, toilets, appear greatly to overbalance the small cost saving which it enjoys in comparison with System C.

System B. Straight 220-Volt

1. Extreme simplicity in wiring changes. 2. Normal multiple lamp operation, using 230-volt lamps.	1. The 230-volt lamps are relatively high in cost and relatively low in efficiency. 2. When 115-volt lamps are replaced by equal wattage 230-volt lamps, the footcandles of illumination are reduced approximately 17%, which in the actual installation, would mean a theoretical reduction from about 18 footcandles to 15.

NOTE:—The high cost and relatively low efficiency of 230-volt lamps give them a decided disadvantage in comparison to other systems. In spite of the fact that the cost of remodeling the wiring system is very low, the use of this system appears uneconomical.

System C. 110/220 Volt, 3-Wire

It permits the use of 115-volt lamps.	Costs more per outlet than Systems A or B.

NOTE:—Even though System C costs more per outlet than either of the other systems, yet this is insignificant when we consider the fact that this system provides an adequacy in wiring which compares very favorably with a completely new system, which was estimated to cost about $20 per outlet.

ELECTRICAL contractors, builders and building owners know the difficulty of increasing wiring capacity in older buildings, where embedded conduit prevents the improvement of lighting and power. If the conduit is already filled to code capacity, there is no way to increase the number or size of conductors in that conduit. And if this conduit is embedded in concrete it cannot be replaced with a larger size.

In either case, the building owner has a choice between two procedures. He can either do a major job of providing new concealed conduit or he can install surface wiring. Both are costly in comparison to the initial wiring system in a new building. The result is that few buildings are rewired unless they are completely remodeled. So it isn't surprising today to find overloaded wiring systems in a majority of our larger buildings.

In designing the branch circuits for the lighting system at Nela Park twenty-five years ago, an attempt was made to forecast the probable increase in wattage requirements for lighting for some years to come. In accordance with the code regulations at that time, no circuit was loaded beyond the 660-watt maximum, but #12 wire was used instead of the usual #14.

The Nela Park buildings, in general, have offices about 15'x17' in size, each with four outlets, originally equipped with four 100- or 150-watt lamps on a branch circuit consisting of two #12 wires. Each branch circuit was placed in ½" conduit running from the panelboard to the office space. About fifteen years ago, the lamp sizes were increased to 200 watts so that each branch circuit was loaded with 800 watts. Again, five years ago four 300-watt lamps were installed. With this loading, which was double or triple the original wattage, the voltage drop in the majority of the circuits slightly exceeded established good practice of 1.5 per cent. Furthermore, the transformer capacity in the vault at the service entrance was inadequate and the main feeders between the transformer and the branch circuit panelboards were overloaded.

To improve the existing conditions, we recently decided to make provision for 500 watts per outlet. It was necessary to make several changes. The capacity of the branch circuits had to be doubled, and larger transformers were required. Also, because of the fact that several buildings were all supplied by mains from the same center of distribution, it was necessary either to install larger main feeders or voltage regulators in each building.

The cost of the second and third items was readily estimated and found to be reasonable. But for the first item, a careful cost study was desirable. Each office space would require two branch

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ty Doubled

By E. J. Edwards
Manager Plant Eng. Dept.
and
Ward Harrison
Director of Engineering,
General Electric Co.
Cleveland, Ohio

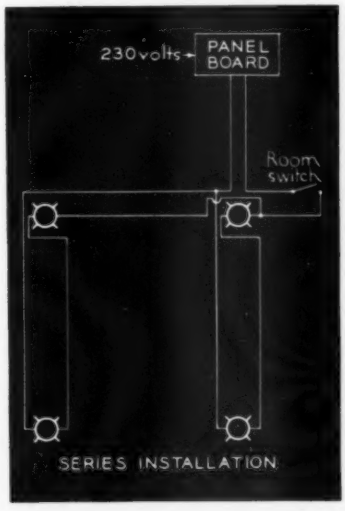
WHERE THE JOB WAS DONE—*Office Buildings of the General Electric Company, Nela Park, Cleveland.*

circuits instead of one, and larger conduit would be required which would not only be difficult to install but costly, because considerable concrete and plaster would have to be chiseled out. Therefore, a practical solution of the wiring problem was sought which would utilize the present conduit. In approaching the problem three different wiring systems were suggested, each of which would provide double the existing wattage capacity available for each office.

System A–Two 115-volt lamps in series on 230 volts.

System B–A straight 230-volt system, employing 230-volt lamps, as is common practice in Europe.

System C–A 115-230 volt 3-wire solid neutral branch circuit to replace each of the present 2-wire circuits.



The suggestion for the use of System C came from Mr. I. F. Baker, engineer of the Bloomfield, N. J. works of the General Electric Company. He was then trying it out in his own factory, without changing the size of conduit installations, where ½" conduit has been used for two #14 or two #12 wires.

So in order to make an economic comparison of the three suggested wiring schemes, an installation of each was made in the Nela Park Engineering Department office building. The labor and material cost for installing each wiring system—not including units or lamps—was:

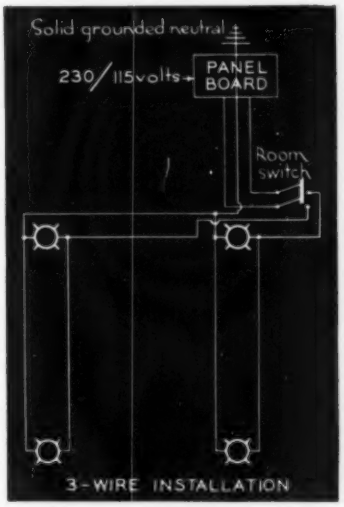
System A (Two 115-volt lamps in series)—$1.80 per outlet.

System B (Requiring 230-volt lamps)—$1.15 per outlet.

System C (115-230 volt 3-wire)—$2.58 per outlet.

Since the three wiring systems each provide different operating conditions for the lamps, however, a cost analysis alone is not sufficient for drawing conclusions regarding their practical use. To determine the best of the three methods for doubling the capacity of the present wiring, we considered all the advantages and disadvantages of each, as listed here. And in the final analysis, System C, utilizing a 3-wire 115-230 volt branch circuit plan, was adopted as the desirable system for rewiring the Nela Park office buildings. This conclusion was based on our practical experience with the three systems, the cost of installation and the economics of operation.

The use of such a system is not new. But in the past, it has been considered limited by code regulations, and unbalancing difficulties. It is applicable to older buildings, because prior to 1931 the National Electric Code specified ½" conduit for three #14 wires or two #12's. The code now permits three #12 wires in this size conduit, so that a 3-wire common neutral branch circuit system can now replace any previously allowed circuit in ½" conduit and thereby increase the wattage capacity for the lighting load. Similar increases in capacity are allowable in other sizes of conduit. Certainly it opens up an opportunity to approach the building owner with a comparatively inexpensive plan for rewiring, rather than demanding a completely new installation.



UMI

AN OPEN LETTER TO NECA

To the Executive Committee of NECA:

Sitting in the sleeper, east bound, I am looking back on the Los Angeles Convention with a critical eye. "What really happened?" I am asking myself. "And what does it mean?" I am going to put it in a letter, in case it may interest you and other contractors.

It is hard to size up a good convention while the sessions are on—or immediately after. Enthusiasm builds up in the meetings out of ideas and applause. The men you meet, the old friends you see, bring a pleasant emotional satisfaction that bends your perspective. It takes a few weeks before you can say "So what?" and be sure of the answer.

Considering the group concerned, the problems involved and their importance to the electrical industry, I feel that this was one of the most promising conventions I have attended. Let me explain—

1 Wiring inadequacy has become one of the most urgent and menacing problems confronting electrical men.

2 The electrical contractor for years has had an inferiority complex and crawled into his local hole. Other electrical men have looked down on his function.

3 Earl Peak has been working unceasingly with power men and manufacturers and wholesalers in the active solution of current industry problems. He has awakened a conscious confidence among contractors. He has built up a growing recognition in the other groups that the National Electrical Contractors Association is a responsible factor in the industry, representing men vital to electrical progress.

Against this background the following features of the Los Angeles meeting take on importance—

1 More than 600 contractors participated in the recent NECA convention—including Los Angeles guests.

2 The program tackled vital problems and produced a very valuable lot of meat for thought and action.

3 Important action was taken in the establishment of a labor relations committee which presumably will deal with the national aspects of labor policy.

4 A party of 142 contractors and their wives went on from Chicago and the East in a 14 car solid compartment convention special, on a 23 day tour. When they arrived in Los Angeles, San Francisco, Portland and Seattle the local contractors received the tour party with programs of entertainment and endorsement that made one wonder if this could really be the lowly contractor himself.

Critics have pointed to the lack of committee programs and committee reports in NECA conventions as evidence of weakness. It's true that past conditions have made this basic organization work difficult. But despite that NECA has initiated and is pushing forward a number of definite movements of practical worth to members and fundamental value to all electrical men—

1 The Electrical Industry Promotion Committee program is pressing for better local organization for market development. Some cities are getting ahead.

2 The Voluntary Agreement program is now in active operation in 24 cities to promote fair bidding.

3 The Fair Trading Policy promotion holds high promise as local groups gain courage in self government.

4 Also, of course, there are the Labor Unit Manual Service and the NECA Accounting Forms that are improving estimating and accounting practice.

5 And now we see the prospect of courageous leadership and intelligent coordination in labor matters—to improve the labor policies of contractors, broaden experience in labor negotiations and find the way to provide for apprentice training. And this, in my opinion, like it or not, is to be a dominating responsibility.

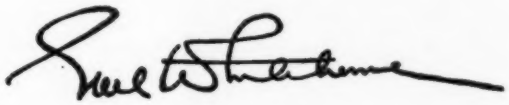
All this, of course, is known to you gentlemen. But the average contractor does not appreciate the value of it all to him. And the rest of the industry has thought little about it. Therefore, I have set it down. And that leads me back to the Los Angeles Convention.

The present urgent need for the re-wiring of most of the domestic, commercial and industrial buildings in America has turned the eyes of other electrical men upon us. And at Los Angeles I saw the spirit and the strength of the electrical contractor stirring to rise and throw off his inhibitions. His confidence is growing—and now it needs objectives, guidance and service.

My feeling is that NECA leadership is fast moving out of its planning and promoting period into a zone of action. In this new phase it will have need for power that it has not used before. It will need strength that can marshal unity of purpose and carry the support of impressive numbers into the orderly government and direction of a more equitably organized industry.

I congratulate you gentlemen. For the future progress of the electrical industry hangs upon the contractor.

Sincerely and gratefully yours,



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LOCAL TREATMENT—*Striplights for the mezzanine display, and recessed units below over the lavatories provide good lighting for areas beyond the effect of the ceiling spotlights.*

BUYER COMFORT—*Highlighted floor displays in showroom employ recessed four-direction spotlight units, while the sheltered displays receive local emphasis that is easy on the eyes.*

HIGH-LIGHTING A SHOWROOM

By Alex Sitkin

Century Lighting, Inc., New York, N. Y.

THE difficult problem in lighting the showroom is to attract buyers to the merchandise on display without their being aware of how it is accomplished. A soft, yet adequate general illumination must be provided, and in addition, the more important items on display must be lighted in such a manner that the customer's attention is drawn to them.

An example of the judicious use of soft, general illumination supplemented by highlighting is to be found in the new showroom of the Crane Co., recently opened at 40th Street and Madison Avenue, New York City. Here skillful placing of recessed ceiling spotlights played an important part in the scheme. To the passerby who glances through one of the street windows, the showroom gives the appearance of a giant display window, with the principal items on exhibit brought to his attention as a result of the highlighting.

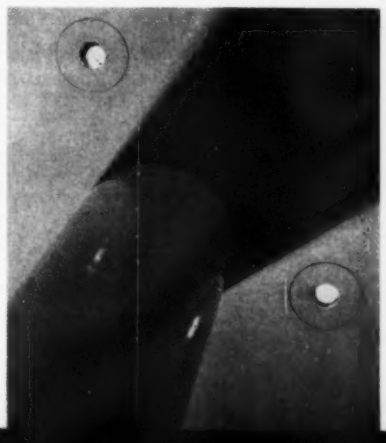
In the center of the floor are three free-standing displays which comprise two combinations of bathroom furnishings and one heating unit. To feature each free-standing display, four recessed spotlights equipped with ellipsoidal reflectors were used. Light is projected through a 3½-inch hole in the ceiling, spotting each display from four different directions at an angle that it is practically impossible for a customer to cast a shadow on the display. Three additional spotlights are used in this room. One illuminates the curved stairway leading to the balcony, one lights the entrance of the showroom, and one lights a pair of lavatories in the central bay of the mezzanine.

The portion of the showroom above the mezzanine is used for displaying lavatories and special equipment for hospitals and laundries. Here strip lights were installed to throw a soft glow of light at the wall-ceiling line to provide totally indirect lighting. These strips are 2 ft. 10 in. in length and contain two frosted, tubular lamps.

At the entrance, a five-foot recessed striplight faced with flashed opal glass illuminates the entire entrance and the reception desk. A similar strip is installed in the bay in the center of the mezzanine. In this case, its light is used to supplement that which is provided by the recessed units in the ceiling. Entering the showroom, there is a glass panel above which is a louvred strip light. This strip prevents the occurrence of a dead spot under the stairway.

Close cooperation and coordination of ideas between the architects, the lighting consultant, and the lighting equipment manufacturers made possible this dual-function system which is at once attractive to the passerby, and inviting to the prospective buyer. The electrical installation, which includes modern equipment for offices and other display areas was by Robert E. Denike, Inc., of New York City.

HIGH-LIGHTING—*A closeup of two ceiling spotlights, in which the unit is attached to the ceiling ring. Relamping is accomplished by dropping down the entire unit out of the ceiling.*



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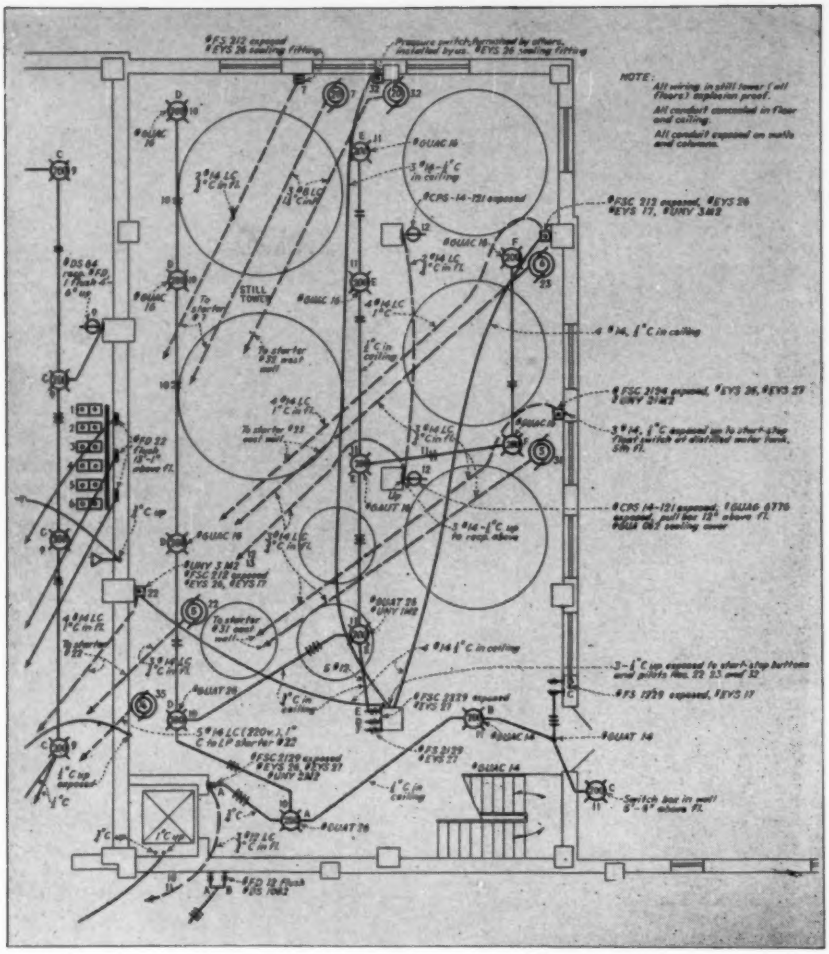

NOTE:
All wiring in still tower (all floors) explosion proof.
All conduit concealed in floor and ceiling.
All conduit exposed on walls and columns.
STILL TOWER

DETAILED DRAWINGS *were prepared by the contractor. This plan of the still tower instructed workmen as to the exact requirements for every run and its various fittings.*

THINKING AHEAD on Distillery Wiring

Louisville's New Seagram Buildings Received Detailed Planning which Simplified the Wiring Job.

SAFETY is the watchword in modern distilleries. So the wiring for the newest Seagram plant was well planned in advance. The new Louisville plant, said to be the largest of its kind, is composed of twin distilleries, comprising sixteen buildings. Included in this great development are: two distilleries, cistern, mill and dryer buildings, a power house, eight warehouses, an office building, a bottling house, and a system of tunnels for transferring barrelled whiskey underground to the bonded warehouses.

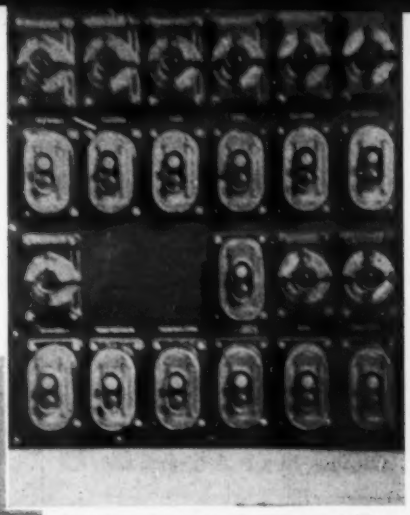
Here were many separate structures to be wired, some having explosive gases that required Class I treatment, others with dusty atmospheres of a Class II nature. Other buildings have excessive moisture, temperature or condensation. But, because of the contractor's careful engineering work, this complicated job was handled more or less by remote control. The Beltzhoover Electric Company of Cincinnati has wired fourteen of the buildings so far. They prepared working drawings and handled various purchasing details all from the home office.

When the general construction drawings were prepared for this project, the electrical design was worked out by engineers to indicate the owners' operating requirements. While these drawings were accurate as to panels, outlets, motor and controller locations, and auxiliary systems, the contractor proceeded to define and clarify every minute detail of each part of this job. This was a tedious undertaking, but the results were well worth all the extra effort and study.

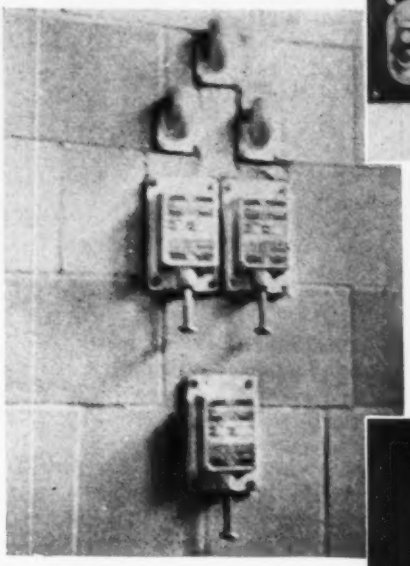
To prepare the job for installation, each floor plan was retraced at the Beltzhoover Cincinnati office. Conduits runs were noted as to size, and the exact types of outlet fittings or sealing fittings were indicated at all locations. By re-spotting spark-producing outlets on the new tracing, an engineer could more accurately study the exact placing of all sealing fittings and junction boxes.

Final details were worked out for the general distribution network for light and power, and this required tunnel feeders to eighteen transformers. Power is distributed at 440 volt, 3-phase, with transformers for the

BEFORE COMMENCING *the job, drawings like this general wiring layout were retraced to show every electrical detail.*



GROUPED CONTROL *centers comprising dust-tight start-stop buttons and pilots for grain conveyors were worked out in detail at Cincinnati headquarters.*



110/220-volt lighting system, connected to the 440-volt feeders. After getting the 52 lighting panelboards properly positioned, the riser conduits and home run conduits could be routed to them in exact detail.

The grouped motor controllers and remote control button lines were worked out in the same manner. The detail drawings indicated the correct fittings at each turn or deflection in a circuit run.

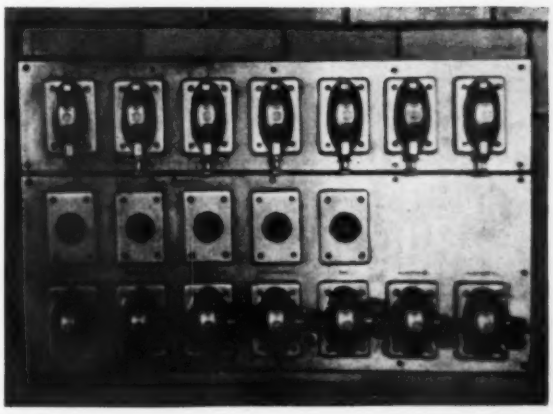
Joseph A. Pope, electrical engineer for the Beltzhoover company, directed the preparation of working drawings, while William Ryan, the company's field engineer followed all details through to completion.

During the progress of this job, the Cincinnati office force could always make accurate check-ups on fittings and other materials needed for the next floor or unit in the plant. Men on the job were supplied with the correct types of materials, avoiding expensive delays or doubling- back on the job. If changes were ordered, the Beltzhoover engineers at Cincinnati were able to revise the detailed layout promptly and instruct the job superintendent with minimum confusion or correspondence.

Although Superintendent Charles Thinnes stayed with the project from the beginning, the company's policy of preparedness forestalled any likelihood of expensive delay should he have been taken ill. The job was worked out in such detail that nothing was left to personal memory. And the avoidance of human errors of omission, or misunderstanding, paid for all this ad vance work in a really complicated installation of explosion proof wiring.

FLUSH SEALING *for explosion-proof switches was accomplished so as to present an orderly finished appearance.*

COLUMN POSITIONING *of explosion-proof switches and pilots, in the still house, worked out without expensive changes or alterations.*



VAPORTIGHT SWITCH AND PILOT ASSEMBLIES *set flush with tile in the fermenting rooms were machine-fitted to heavy monel metal plates and recessed boxes.*

UMI

INSTRUMENTS AS SALES TOOLS

Instrumentation is on the increase among contractors who are active in selling modernization. This digest of replies from 226 typical firms shows that fact-finding methods are essential to progressive methods.

TO find out what industrial and commercial contractors are doing with portable electrical measuring instruments, what instruments they use and why they use them, *Electrical Contracting* has been gathering information from the field. Some 226 contractors emphasize the growing need for facts in selling industrial or commercial modernization.

Industry is keen today for information that will disclose inefficiency, hidden losses, prevent stoppage or breakdowns and solve perplexing problems in plant expansion. Much of this information can only be obtained by plant surveys with electrical testing and measuring instruments. For instrument surveys are authoritative if prepared intelligently. And the findings are convincing, say many of our experienced contractors. They are making every-day use of them. It is smart selling. It is the modern way of doing business.

Those who are skeptical about this modern method—who are willing to deal in guesswork methods rather than in real facts, may find this digest of value. This information and voluntary comments from representative contractors leaves no doubt that modern business men want definite evidence before they act. Here are the questions that were raised—

What are the principal everyday uses for portable instruments? It appears that their functions fall in four major classes, (A) To aid in selling better wiring (38 per cent of cases), (B) To check finished work on new construction and modernization jobs (58 per cent of cases), (C) To check power and light wiring and machine performance in industrial plants (85 per cent of cases), and (D) To test motors and other apparatus in plants or at the repair shop (82 per cent of cases.)

How many instruments are in use? The 226 firms claimed ownership of 1801 portable instruments of various types, makes and sizes. This is an average of about eight instruments per firm.

What is the contractor's investment in portable instruments? From the figures given, inventories range in cost from $150, $500, $750, $1200, and so on up to $3,000. Because of wide variations in the amount of work done by these firms, the average inventory is rather misleading. A cross-section of companies engaged chiefly in industrial wiring and motor repairs disclosed

[CONTINUED ON PAGE 53]

How Instruments Help the Contractor

1. Obtain facts for rewiring recommendations by disclosing
   a. Unseen losses in the electrical system
   b. Need for adequate system of distribution
   c. Requirements for proper levels of illumination
   d. Hazards of inadequacy to safety and production schedules.
2. Make performance and load tests
   a. Voltage drop and fluctuations
   b. Power factor losses
   c. Load peaks and duty cycles
   d. Provision for increased loads
3. Check apparatus performance and efficiency
   a. Overloaded and underloaded motors
   b. Contacting burdens and duty cycles of controllers
   c. Motor torque and friction losses
   d. Speeds, vibration, and synchronism
4. Secure maintenance and general cost data
   a. Periodic tests of system conductors and motor windings
   b. Maximum demand and off-peak load studies
   c. Correction of conductor or contact heat and unbalance conditions
   d. Detailed studies of group drives and machine operations

PERFORMANCE TEST *of welders in a manufacturing aisle to get production facts.*

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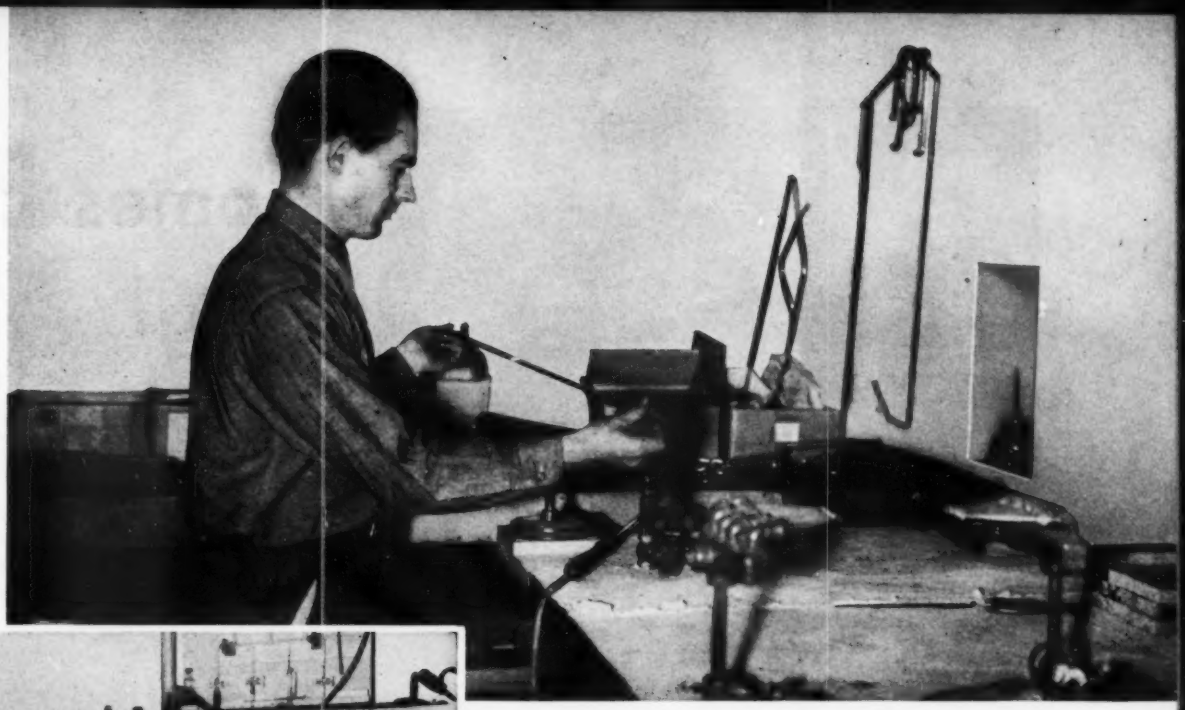
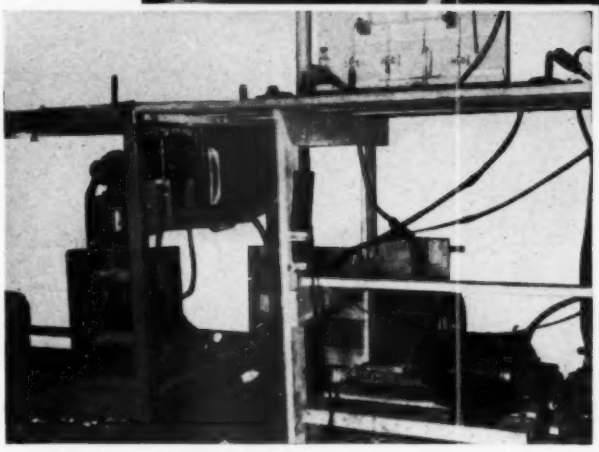


BENDING THE TUBES—*A ten inch narrow flame is used to get the broad curves in sign work. The point jet in the foreground takes care of the sharp bends.*



EQUIPMENT—The *5 kw. "Bombarder" at the left removes impurities from the glass in preparation for the neon gas. A high vacuum exhauster, at the right, removes the air from the tube.*

Specializing in NEON

Gas Tubes Make a Profitable Specialty for this Binghamton Contractor

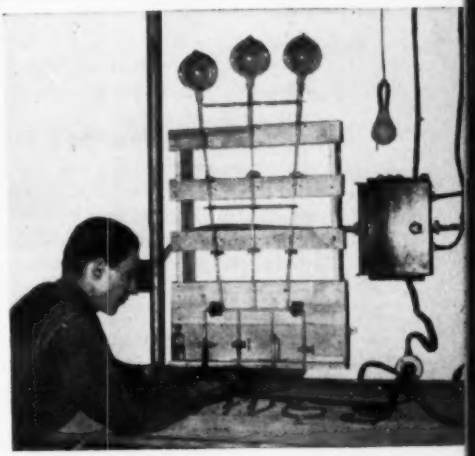
GASEOUS tube lighting is an important branch of modern commercial and display lighting. So the Reiter Electric Company, of Binghamton, New York, makes this a specialty of its complete lighting and repair service.

Neon tube design requires a moderate investment in equipment and trained men to handle the glass. But the technical features are well within the ability of the well equipped electrical contractor, according to Donald Warburton, neon specialist with this company. Starting with modest repair equipment, several years ago, the shop has grown to include all types of neon sign work and decorative lighting designs. This year the neon work will exceed a third of the total lighting sales.

A portion of the shop is partitioned off for the tubing design and make-up department. Here the glass is bent in special gas jets, to fit the pattern. A 15,000 volt "bombarder" of 5 kw. capacity is then connected to the tubing to drive out impurities and heat the glass. A vacuum pump removes the air and the gas is ejected. The tubing shop requires the services of an experienced glass man, for the design and fabrication of the tubes. The installations are made by the regular electrical crews.

Most of the work consists of routine repairs and installations of signs, and display specialties in commercial establishments. Occasionally, however, an opportunity for unusual and spectacular lighting combinations has given this contractor a clear field in selling a complete lighting installation. With both neon and incandescent sources to choose from, they can work directly with the customer to get the most attractive lighting effects.

GASSING—*The three supply flasks contain the gas which gives the color desired. Red and blue are most frequently used. Gas is injected after the tube is finished and exhausted of air with the electrodes in place.*



UMI

Homes Buy QUALITY WORK

NEW HOMES *like this deserve and secure quality wiring from this suburban firm of go-getters.*

THERE IS A STORE *for displaying appliances, fixtures and supplies. Herb Leswing, out front, says it pays.*

FOR MOBILE SUPPLY *to every home and job, there is equipment like this.*

Suburban Philadelphia organization of 15 employees celebrates 20th anniversary of community service

LIVING with one's neighbors for 20 years in a community like Jenkintown, Pa., might be considered in itself a modest success for an electrical contractor. Too often the basket boys have come in during such a span of years, like the locusts and other pests, and reduced the ambitious suburban contractor to a state of slim pickings.

With Hugh B. Scott and Herbert Leswing it has not come to pass. Their firm, known as Jenkintown and Glenside Electrical Construction Company Inc., is very much in evidence after 20 years in business. And the mainstay of this company's steady volume depends on Mr. and Mrs. Suburbanite. They have made these neighbors want more than basket service.

How can you beat the competitive racket? Well, Herb Leswing has taught all his outside men how to fill their own weekly pay envelopes. They know how construction work is done. They also know how to get along with folks. They are neat and clean on the job, and "sell their shop to the customer." The salesmen have the same sort of viewpoint as a result of Hugh Scott's merchandising tutorship.

So, homes value quality and full-comfort wiring in the Jenkintown area, and often a complete outfitting with major appliances by the merchandising department. And it is all due to determined training of manpower. The entire organization works together for mutual profit. As a result there are specialists for every kind of job. Whether it's refrigeration or oil burner trouble, a balky neon sign, or an extra-tough job of concealing a switch leg in a fine old residence, Boyd and Leswing are not left alone to face a disgruntled customer. They are merely the bosses among 15 well-schooled fellows who keep their babies in shoes by serving generous homefolks.

When the company celebrated its 20th business anniversary this summer, a two-page "Success" story appeared in the community newspaper, which told about the steady plugging done by these boys. It was all good showmanship, with pictures of the bosses, their smiling employee group, the store, lists of jobs done, and accompanying ads about this company's services. Several statements stick in the reader's mind.

1. The company is claimed to be one of the 10 best Home Servants Dealers for a leading maker of home appliances.

2. A reputation for fair prices and high class well-paid workmen.

3. Instead of a crew of wire pullers, certain men are also specialists covering radio, washing machines, fixtures and refinishing, motors and controls, and other vital parts of the home or store electrical system.

So basketeers can't stop this "gang." They merely emphasize their own shortcomings, and strengthen this company's right to serve a typical American community. And it all pays profits.

½ Billion Dollars' Worth of Opportunity

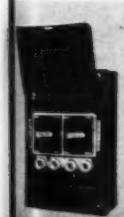
lectrical equipment to the tune f 16 billion dollars is needed to upply the homes in this country. Millions of people are back at ork earning bigger wages, and ney are buying steadily as sales gures for the industry show. his is an unparalleled oppor- unity. Wise merchandisers know hat the time has come for a change of pace in selling . . . that *quality* equipment has the call in this new market. They feature Cutler-Hammer Meter and Service Entrance Equipment as the logical start of such an installation. CUTLER-HAMMER, Inc., *Pioneer Manufacturers of Electric Control Apparatus,* 1306 St. Paul Ave., Milwaukee, Wis.

CUTLER-HAMMER
SERVICE EQUIPMENT
C-H

is

BETTER SERVICE EQUIPMENT

Better for the Contractor
Better for the User
Better for the Power Company



Cutler-Hammer Range Switch (Cat. No. 4334H15) is built to make installation easier, to save service calls by fool-proof operation and to make periodic inspection possible without interrupting service.

Cutler-Hammer Water Heater Switch (Cat. No. 4142H1) has set new standards of dependability and safety. Another model (Cat. No. 4142H2) combines two of these switches in one to save space and installation costs where two circuits serve the Water Heater.

UMI

Editorials

Earl Whitehorne, Editor

The Inspectors Have Their Chance

Every autumn the electrical inspectors hold their conventions in various sections of the country. Every year men come before them urging them to broaden their function, by giving the public sound advice on the adequacy and utility of an installation, as well as its safety.

There was a time too, when the policeman only looked for wrong. He also was just protective. His job was to find somebody breaking the law and arrest him, and the cop was universally hated. Then came the automobile and traffic congestion. And he quit just walking his beat and went out on the crossing to be helpful. Now the police officer is everybody's friend, and he has a better job.

The inspector has the same good opportunity for broader service. People have buildings wired for the sole purpose of securing the benefits of electricity. If they fall for chiseling bids, if they unknowingly accept poor workmanship or facilities unequal to the natural needs of the situation, either in number of outlets or size of copper, somebody should say so. And who but the inspector?

Because inspection of electrical work was started by the fire insurance companies, we are bound by a tradition that inspectors should consider only safety. Let's break this fool rule. Let's have the inspector tell the owner not only that the job is safe, but whether he has received what he ordered, and whether the system is right for his needs.

There are a dozen reasons why many inspectors are apathetic or opposed to this suggestion. What of it? A broader scope will give the inspection service far greater opportunity to prosper. It will assure the public of a square deal. It will certainly be to the advantage of the responsible contractor and make a market for more material and labor. Why do we wait? Surely we can sell such a good idea to most inspectors if we try.

As Easy As That

Some electrical contractors have too much trouble making money. Competition is keen they say. Ten men are after every job and profits are cut to the bone. It takes a lot of cooking to make a little gravy.

But there is a surprising number of other contractors who don't worry about competition at all. In the same market, they seem to be in an entirely different business. They enjoy a steady volume with a good force of men regularly employed and a comfortable margin for earnings.

The reason for this contrast is clear enough when you analyze it. One man is continually on the hunt for something that somebody is giving out. The other is busy serving customers. One can get his orders only by matching prices with other contestants for anybody's job. The other has a regular group of accounts that come to him year in, year out, when they want electrical work and, confident of good service at a fair price, call in no competition.

Hear what complaining contractors say and you begin to think that electrical construction is a hopeless way for a man to try to make a living. There is so much argument about cost scalping and price cutting and giving work away, it seems that the whole trade must be in conflict and confusion. But listen closer and beneath the louder clamor of the discontented, you hear a softer, stronger voice of confidence and satisfaction. These are the men who are making money regularly this year and next, and they don't waste much time in talking about it.

The fact is that there is as good an opportunity for profit in the electrical contracting business as anywhere else. But, as everywhere else, it flows to men of business capacity and judgment. The main trouble with these struggling contractors is that they give all their attention to construction details and neglect their business operations. And so they lose or waste, nearly as much money as they make—and make too little.

The success of the contractor comes from good buying, good selling, good management and good service to customers. Out of this, naturally comes the ability to figure low, to handle jobs efficiently, to spend time with customers. And this builds good reputation, wins confidence and holds customers. It is as easy as that.

A Move For Better Building

Seekers of small homes should be glad the jerry builder is to be checked up, under the recently announced Federal Home Building Service Plan. It is proposed that new homes costing $7500 or less are to receive architectural advice and supervision. Loaning agencies and architects are to see that the prospective small home owner's money yields the best possible return. The plan is already endorsed by financial institutions in several important localities.

Contractors are constantly up against the jerry builder and his trick of eliminating needed comfort-giving electrical features in order to put over cheap house construction. Only in a few cities have Red Seal certificates brought them to shame. So with the public indifferent, it has been a losing battle.

Now the Federal Home Building Service Plan is being tried. But it should not be left for lending institutions alone to support it. Contractors

UMI

and leagues too should get busy on this jerry problem and work with local architects to checkmate skimpy wiring through this new plan.

Our Pet Enigma—The Three-Way Switch

Most contractors have learned not to talk volts, watts and amperes to the customer. It took a long while for us to find out that that jargon means nothing to the average man or woman and just makes the selling harder. But we still go on calling a switch that operates from two locations a "three-way switch". No wonder we install about ten per cent as many as we should.

Some people call them "step saving switches". It is better than "three-way"—which sounds like a deliberate effort to confuse. You might as well call a clock a "cog set". The point is—What does it do?

God knows why no master mind has come along to give this red headed step child an honest name. But we need not damn him by dubbing him a what-is-it. We can at least make ourselves understood. So until somebody has an inspiration and produces the magic word, let's call them "step savers"—a homely and appealing thought. And put four times as many in each job.

High Ball for Progress

Arguments have charmed lives. They never die and waste more power than a water fall—without providing any scenery.

George Andrae, of Milwaukee, at the inspectors' convention in Chicago, dug up three old timers and asked for action. He urged that something be done about eliminating black conduit. He called for an end to stalling over the non-tamperable fuse. He said that more could be done to reduce the cost of wiring by standardizing service entrances and metering switches than by new wiring materials that threaten safety standards.

It is amazing how long these things have been talked about by electrical men and how little has been done. It is true that white pipe has grown greatly in use, that non-tamperables are actually on the market, and that certain power systems have developed such standardization among their own companies and saved the consumer money. But the talk goes on, with the average man wedded to his ways and intolerant of change.

It is good to hear this occasional shouting for progress. And in the end it comes laboring along. What we need is a joint industry meeting, once a year, to settle all lingering controversies and give Old Man Evolution a clear track.

Back Talk

Suggestions for the Code

To The Editor—

I like your "chocolate sauce" very much and it suggests to me that in following through on this subject you might care to say something about the scrap book editions of the Code that our Association is getting out this year, for distribution to those particularly interested in developing a sensible National Code.

These scrap book editions were made up by using the type in galley-proof form and are printed on 8½ x 11 sheets providing ample blank page space for entering notes for proposed revisions and changes. There are a limited number of copies which can be purchased or given away. Something on this subject would follow very logically after your editorial.

Allan Coggeshall
Hatzel and Buehler, Inc.,
New York

It is a good idea. Every contractor, interested in promoting Code progress, should write his suggestions in one of these scrapbooks and send it to the NECA members on the N.F.P.A. Electrical Committee. They are entitled to some help. They have a hard task on their hands.

Will Cheaper Wiring Sell More of It?

To The Editor—

I do not feel that you are taking the right point of view on the cost of wiring and wiring methods. You seem to think that because utility companies feel that wiring can be made cheaper it is in some way conflicting with the interests of the contractors.

On the contrary, utility companies feel that cheaper wiring means more wiring and is therefore of benefit to the contractors. In fact, if cheaper wiring did not mean more wiring utility companies would not be advocating it, since it is only for the purpose of getting more wiring installed that it is of interest to them.

Therefore, the question is a very simple one—Are the utility companies wrong in their assumption that cheaper wiring will result in more wiring, or are they right? If they are wrong then they are working for something which is of no advantage to them. If they are right then the contractor has as much to gain as the utilities—possibly more.

In other words, instead of arguing about the conflict of interests, which you seem to accept as a fact, is it not quite another question, namely, are the utility companies right or wrong in their assumption?

If they are proven to be wrong they might as well forget cheaper wiring. If they are proven to be right, the contractor should be equally interested in cheaper wiring. Therefore, there is no conflict of interests once the facts are established.

It seems to me this question should be argued on the basis of whether or not cheaper wiring will mean more wiring, not on the basis of other elements involved in the question, which are of no interest whatever to utility companies.

So why not let's try and settle this question and then the other questions will settle themselves.

H. E. Young, Vice-President,
Northern States Power
Company, Minneapolis

Fair enough! Let's agree that cheaper wiring will mean more wiring sold. But, waiting for some cheaper form of wire is not the way to get it. More can be accomplished by large scale organized selling of house wiring that will bring cheaper mass pronuction methods and prices. The wire is not more than say 12 per cent of the price of the job. There are better places to develop economies. So let's get going with the rewiring job and develop volume and savings will come through both materials and methods—welcomed by everybody.

The Big Thing

To The Editor—

Your editorial, entitled "No Chocolate Sauce," in the September issue of Electrical Contracting is splendid.

The big thing, and practically the only thing, is to develop the electrical industry just as rapidly as it is possible along sound lines. I am greatly pleased to note that you have taken advantage of this opportunity to point out to some of our friends how unwise it is to allow details and hurt feelings to interfere with what is the main purpose of all of our efforts.

D. H. Murphy, President,
The Wiremold Company,
Hartford

"The big thing!" That is all that all of us are really interested in. But opinions naturally differ as to how to accomplish it. Let's speak our minds frankly on all sides and work it out. Thanks Mr. Murphy.

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"We spiked shutdowns on our Grinders by using . .

FUSES MADE TO PROTECT -NOT TO BLOW"

BUSS Super

UMI

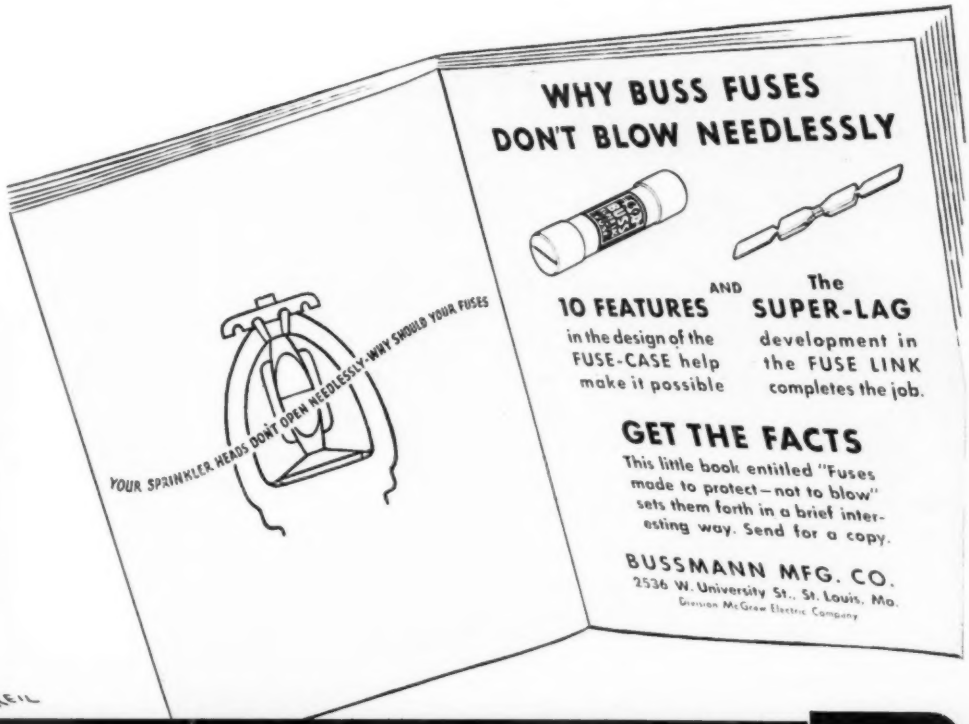
HERE'S THE STORY... Says

Mr. R. MONROE, Chief Electrician of American Brake Shoe and Foundry Co., Mahwah, N. J.

"Prior to June 29th, 1933 we experienced great trouble in getting ordinary 60 ampere 250 volt renewable fuses to hold the starting load of one of our grinders. These fuses blew about twice a week.

On June 29th, 1933 we installed BUSS Super-Lag Fuses then stood by and started the grinder up 10 times without one blow.

On January 8th, 1934 we checked this installation and found the same fuses still in service. Checked again on January 27th, 1936 and found no blows to date."


YOUR SPRINKLER HEADS DON'T OPEN NEEDLESSLY-WHY SHOULD YOUR FUSES
WHY BUSS FUSES DON'T BLOW NEEDLESSLY
10 FEATURES AND The SUPER-LAG
in the design of the FUSE-CASE help make it possible
development in the FUSE LINK completes the job.
GET THE FACTS
This little book entitled "Fuses made to protect—not to blow" sets them forth in a brief interesting way. Send for a copy.
BUSSMANN MFG. CO.
2536 W. University St., St. Louis, Mo.
Division McGraw Electric Company

KEIL

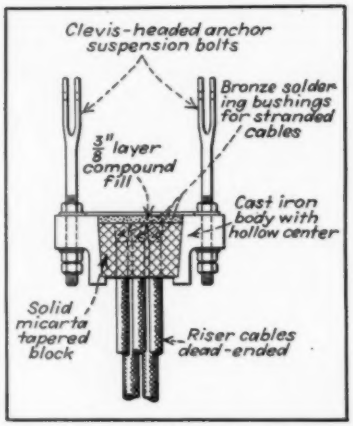
Lag FUSES

WIRING Methods

SAFE CABLE STRAIN RELIEF

Heavy cables in the riser shafts of the Mellon Institute of Industrial Research at Pittsburgh are provided with dead-end anchorage. It makes a solid mechanical and insulated assembly which avoids pinching or compressing the conductor insulation wall. In addition to the cable anchors, the Iron City Engineering Company built heavy steel struts into the riser cabinets which gave unusual flexibility for aligning the anchors directly above their respective conduits. As a further precaution, all sets of cables were wrapped with fish paper where they made contact with conduit bushings.

Two horizontal 3-in. by 3-in. T-irons were spaced 6½-in. apart in the top of all riser supporting cabinets, provided with ⅝-in. holes at 2½-in. centers for anchor suspension bolts. The cable anchor design employs a hollow cast iron body with two bolt ears for ½-in. clevis type suspension bolts. The hollow body acts as a tapered socket for a tapered gear micarta block. This block is drilled with tapered holes or sockets to receive hollow, tapered bronze cable supporting thimbles that are soldered to the various conductors. The micarta block complete with its soldered bronze thimbles, set ⅜-in. below the top rim of the cast body for receiving a layer of insulating compound. The compounded top is then shielded with a flat plate of ebony asbestos. This plate has ears which engage the ½-in. bolts, and it may be swung away during the compounding process.


Clevis-headed anchor suspension bolts
Bronze soldering bushings for stranded cables
3" layer compound Fill
Cast iron body with hollow center
Solid micarta tapered block
Riser cables dead-ended

TAPERED UNITS—Soldered thimbles fit into tapered holes of micarta block secured in cast iron suspension body.

NO PINCHING—*Dead-end cable support in riser cabinet makes heavy conductors fast within insulated taper-fit assembly.*

This photograph shows a cable riser consisting of seven 300,000 c.m. conductors, from which 4/0 solderless taps were made for feeding a panelboard alongside. The group of straight-through conductors at the left were supported in a similar manner on the floor below.

PREVENTS VAGUE ORDERING

It often costs time and money when out-of-town foremen make errors in ordering materials by mail for a job. Patterson Electric, Ltd. of Toronto therefore provides its superintendents with a compact set of reference literature from which to write up orders that are to be mailed in for purchasing. Catalogue numbers of special items must be given, and in addition the catalogue and page number from which the selection was made. Exact duplicates of all field literature are kept at this company's office to assure correctness in handling all such orders.

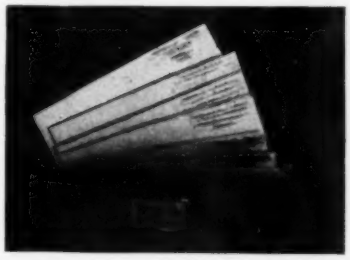
When an order is received it is possible for the office staff to check up special items accurately. Should the foreman have written a number illegibly, the catalogue page number provides a helpful clue toward identifying what is wanted. Furthermore, this check-up system often eliminates the purchase of items that are not suited for a particular job. Finally, this system speeds up placing orders, because it eliminates prolonged correspondence, telephone or telegraph tolls.

THEY MAKE THESE DRAWINGS BEHAVE

Large jobs usually entail bales of big blue prints and a heap of smaller ones for detail. Here is the way they are kept get-at-able in the field office of J. Livingston & Company at the Mid-Hudson Tunnel job, New York.

The big drawings are hung from clamped wood strips that hook on a temporary rack, at the designated berth for each set of drawings.

DRAWING STORAGE—Large drawings and special details are kept in order at field office for big wiring job.



FOLDED DETAILS—System of folding small prints prevents "dog ears" and permits lettering reverse for quick identification.

For detail drawings, this company uses a steel filing cabinet. The close-up view shows several such details pulled partially out of a drawer containing about 300 properly filed blue prints. They all measure about 24-in. by 34-in., but are folded to 9-in. by 14-in. Envelopes are not required, nor do the prints

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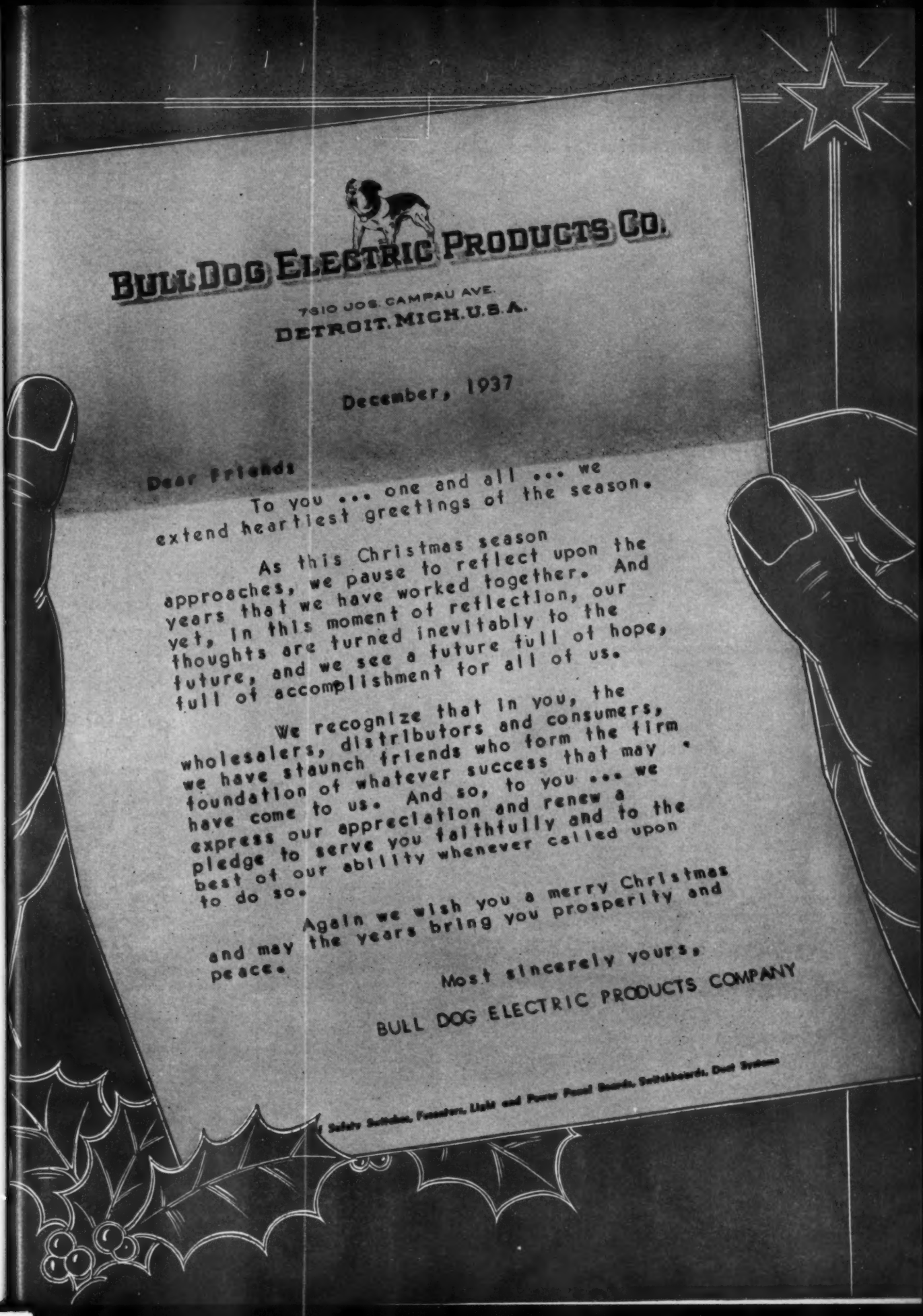

BULL DOG ELECTRIC PRODUCTS CO.

7310 JOS. CAMPAU AVE.
DETROIT, MICH. U.S.A.

December, 1937

Dear Friends

To you ... one and all ... we extend heartiest greetings of the season.

As this Christmas season approaches, we pause to reflect upon the years that we have worked together. And yet, in this moment of reflection, our thoughts are turned inevitably to the future, and we see a future full of hope, full of accomplishment for all of us.

We recognize that in you, the wholesalers, distributors and consumers, we have staunch friends who form the firm foundation of whatever success that may have come to us. And so, to you ... we express our appreciation and renew a pledge to serve you faithfully and to the best of our ability whenever called upon to do so.

Again we wish you a merry Christmas and may the years bring you prosperity and peace.

Most sincerely yours,

BULL DOG ELECTRIC PRODUCTS COMPANY

Safety Switches, Fuseless, Light and Power Panel Boards, Switchboards, Dust Systems

GREENLEE

PROFIT MAKERS *For The Contractor*

THE greater the efficiency of the tools you use, the more chance you have of meeting competition and making a profit on each job. That is why Greenlee Conduit Benders and Knockout Tools are so popular. They cut costs on every job and are liked by the men who use them.

Hydraulic Conduit Benders

Greenlee Hydraulic Conduit Benders insure profits, because they bend conduit quicker and easier than by other methods. In addition, they make smooth, even bends, eliminating many fittings and making it easy to pull in wire and cable. They are easy to take to the job, too, because they are readily portable.

Knockout Tools

Greenlee Knockout Punches and Cutters are time savers and profit makers, because they make it easy to enlarge holes in switch boxes, cabinets, etc. They form clean-cut holes quickly and accurately, without reaming or filing.

OTHER TOOLS: Hydraulic Pipe Pushers, Ball-Bearing Joist Borer, Electrician's Bits, Bit Extensions

GREENLEE TOOL CO.
ROCKFORD ILLINOIS

GREENLEE TOOL CO, Rockford, Ill.

Please send complete information on the following:

☐ Knockout Tools ☐ Conduit Benders

Name.....

Street.....

City.....

State.....

My Jobber is..... 12-37

WIRING Methods

[FROM PAGE 26]

become "dog-eared". Their back or white sides are captioned and numbered for quick identification and for numerical filing.

BARE NEUTRAL TABLE

Wm. A. Haig, chief electrical inspector of Milwaukee, recently prepared a table of sq. in. areas for bare copper wire. He uses it to figure the correct conduit sizes to use when combinations of bare and insulated copper conductors are involved. The areas, as given below, include the voids or air spaces between the strands, and are not merely the total area of the various strands of solid copper which comprise one bare conductor.

In submitting this table, Mr. Haig points out that the use of bare neutral service conductors, as covered by rule

Size	Type	Total Area, Square Inches	Carrying Capacity Amperes
8	Solid	.013	50
6	Stranded	.0263	70
4	Stranded	.0419	90
2	Stranded	.0665	125
1	19 x .066	.0865	150
0	19 x .075	.109	200
00	19 x .084	.137	225
000	19 x .094	.173	275
0000	19 x .106	.219	325
C. M.			
250,000	37 x .082	.259	350
300,000	37 x .090	.309	400
350,000	37 x .097	.364	450
400,000	37 x .104	.414	500
450,000	37 x .110	.467	550
500,000	37 x .116	.518	600
600,000	61 x .099	.624	680
750,000	61 x .110	.785	800
1,000,000	61 x .128	1.04	1000
1,250,000	91 x .117	1.29	1180
1,500,000	91 x .128	1.58	1360
1,750,000	127 x .116	1.89	1515
2,000,000	127 x .125	2.07	1670

BARE WIRE—Table of areas for computing size of service conduit to take bare neutral and insulated conductor combinations.

402-d and 404-d of the Code, sometimes permits the use of a smaller service raceway. This is when the combined areas of bare and insulated conductors are computed under the 40 per cent area rule, as given in table 5 on page 54 of the Code.

The procedure in making such calculations is to figure the 40 per cent area of conduit from table 8, page 55, of the Code. The combined areas of all insulated conductors plus the area of the bare neutral conductor may then be compared with that of a conduit size which gives the correct space for these conductors. Some conductor sizes and combinations, where a reduction in the size of conduit may perhaps be made, are: three No. 8's; three No. 6's; four No. 4's; three No. 2's; four No. 1's; three No. 1/0's; four No. 2/0's.

READY TO GO—*That snappy new truck cruising around the vicinity of Waterbury, Conn. belongs to Clapp, Rose and Vaughn, electrical contractors of that city. Streamlined, with an efficient "pick up" body, it gets around to all the best places in a business-like way, telling the world that this firm is meeting modern demands with modern methods. An exceptionally strong conduit rack was provided along the left side. Under the front fender is a heavy brace which provides good fender support, because it is bolted to the car frame.*

THEY SELL OUTLETS BY SUGGESTION

Systematic selling of outlets is made a follow-up on wiring jobs done by the Midwest Electric Wiring Co. of Denver. Robert Y. Chedister has developed an approach that every wireman of his must use on the housewife, before he gathers up his tools to leave.

Instead of suggesting a new outlet for the kitchen or the bathroom, the electrician takes note of the appliances in use in each room. A bottle warmer or an electric razor may give him the lead for a bathroom sale. He sells the need for an outlet instead of the outlet itself. Noting an electric clock, he suggests a new flush outlet.

Each electrician reports on the result of his suggestions when he returns to the shop. In this way Chedister checks on whether his crews are using the suggestion plan.

"By consistently enforcing this rule we find that our men develop adeptness at selling outlets," says Chedister. "The only problem is convincing them that they can sell. Once they find they can, they use the plan sucessfully."

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CONTACT!

YES!...100% CONTACT AND here's why!

THE WESTINGHOUSE DIAMOND-POINTED JAW AND EXTENDED BLADE

is an exclusive feature in Westinghouse Safety Switches that insures extra years of efficient life.

THE WESTINGHOUSE EXTENDED BLADE

meets the break-jaw at one point only. Arcs and resultant beading are confined to this area, which falls entirely outside of the contact surfaces when switch is closed. This insures complete union between blade and jaw, unaffected by time and usage.

Westinghouse *Safety Switches*

●The principle of the Diamond-Pointed Break Jaw and Extended Blade used in Westinghouse Safety Switches is extremely simple. Yet it is one of the biggest reasons why these switches give reliable service for years beyond the ordinary switch's life.

Extreme simplicity, in fact, is a distinguishing feature of Westinghouse Safety Switches. Copper parts are of solid one-piece or milled-and-ground construction, eliminating most of the customary screws and bolts. Bases are of one-piece, non-carbonizing composition. Contacts and fuses are accessible for inspection by simply opening the cabinet.

By standardizing on Westinghouse Safety Switches, you can assure yourself of maximum savings on repairs and replacements. All commercial types and ratings, Types A, C and D. Call or write your nearest:

Electrical Wholesaler — Electrical Contractor — Motor Dealer

Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

J 20300

DE•ION

Switches in ratings of 575 and 600 volts are equipped with the famous Westinghouse "De-ion" Arc Quencher. In the past, arcs have been broken by "stretching." The "De-ion" quencher confines, divides and extinguishes arcs instantly—obviously preventing concentration of burning heat on contacts or arc barriers.

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Motor Shops

CANADIAN DEFROSTER

When Jack Frost begins to dress store windows in Quebec, the Electrical Rewinding Shops turn on these electrical

HEATED WINDOW—Resistance wire strung on insulators prevents frosted windows at Quebec motor shop.

plate glass defrosters. Using spans of No. 20 chromel resistance wire run horizontally on insulators, along the inside of the window plate, there is just enough heat loss at 1-amp. to keep the glass clear of frost.

TO MAKE WINDINGS RESIST DAMPNESS

Every motor shop has customers who operate motors intermittently, in extremely damp atmospheres. When these motors are running, all goes well, but during their idle periods an objectionable amount of moisture is often absorbed by the windings.

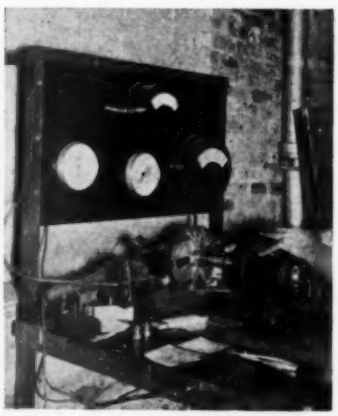
To prevent this moisture absorption cycle, the Electrical Motor Repair Company of Tenton, N. J. has been successful in applying heated compound to the motor windings after they are first cleaned of grease and dirt. Several manufacturers of insulating products make a high grade compound for this purpose. The treatment requires heating the compound in a heavy heat-retaining vessel until its consistency permits pouring it feely with a preheated ladle.

The compound runs over the windings and fills all crevices up to the stator cells and when cooled, forms a glossy protective film. Except where there are excessive operating temperatures, this treatment is said to add considerably to the life of motors operated in damp locations.

SMALL MOTOR TEST BENCH

Refrigeration motors rewound in the "Ermco" motor shop in Chicago, are subjected to severe operating tests to determine maximum overload. The motor is coupled to a disc brake which is slowly operated by a valve handle until the motor stalls. Meter readings give the r.p.m., horsepower, watts and amperes at the point of breakdown.

The torque testing mechanism consists of a double disc 7½-in. clutch in which the center plate is coupled to the motor. At a radius of one foot, the outer discs are anchored to a diaphragm operating the torque indicator. The motor is mounted on an adjustable base and the brake is free to swing in a vertical plane allowing adaptation to any motor size.



BRAKE TEST—Gives many valuable indications at the point of maximum overload, the meters read horsepower, r.p.m., watts and amperes.

COMPACT MOTOR STORAGE

The Penn Electrical Engineering Company, of Scranton, Pa., was faced with the problem of storing a large number of used motors of the same size, in a limited floor space. A simple stacking arrangement was finally used. A 2x12 plank laid over the top of each row made a shelf for the next tier. In this way the motors could be piled six deep. As they are all identical, it is rarely necessary to get at an individual unit. However, wedges driven between the plank and the two adjoining motors will quickly release any one from the stack.

STACKING MOTORS — Convenient storage in small floor space is accomplished by laying planks over each tier, making a shelf for the next row of motors.

PROFIT IN OIL CORRECTION

When motors become chronic oil-throwers, George W. Wood of Chester, Pa. equips them with oilers. Everybody is happy because the trouble is checked —and Wood has made another profitable accessory sale.

The 3 h.p., 2-phase motor shown, was

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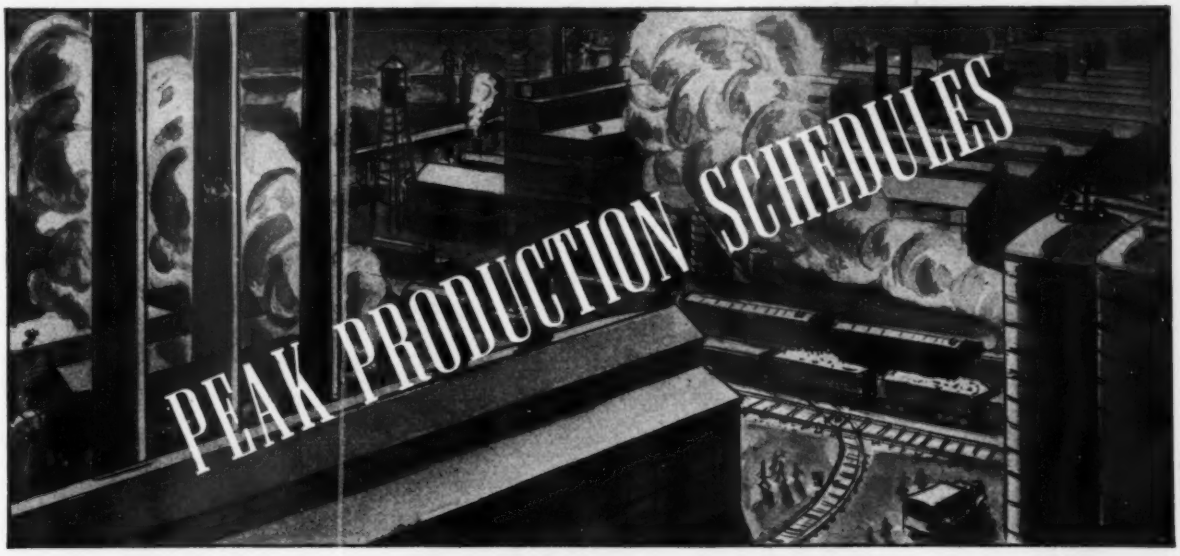
INCREASING DEMAND



BUSY INDUSTRY NEEDS YOUR SERVICES

...AND DELTABESTON

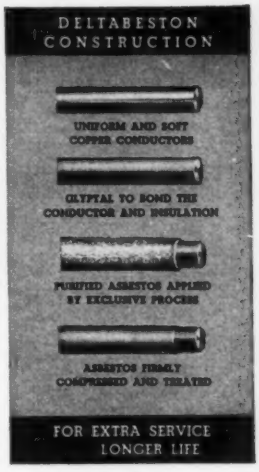
Your business is not restricted to new construction. Today, there is an immense market for repairs and replacements. Existing electrical equipment must be in tiptop shape. Motors must provide constant . . . uninterrupted service.

As an electrical contractor, your cue is Deltabeston Magnet Wire. Motors wound with it give above-average performance . . . day after day.

Deltabeston Magnet Wire is insulated with Purified Asbestos. Excessive heat and moisture do not affect its dependability. Overloads . . . more frequent with today's production standards . . . do not damage Deltabeston reliability.

Act now! Write for complete information on Deltabeston Magnet Wire . . . and the complete line of Deltabeston conductors. Address Section Y-8812 Appliance and Merchandise Department, General Electric Company, Bridgeport, Conn.

Deltabeston Wire and Cable is distributed by General Electric Merchandise Distributors and Graybar Electric Company.


DELTABESTON CONSTRUCTION
UNIFORM AND SOFT COPPER CONDUCTORS
GLYPTAL TO BOND THE CONDUCTOR AND INSULATION
PURIFIED ASBESTOS APPLIED BY EXCLUSIVE PROCESS
ASBESTOS FIRMLY COMPRESSED AND TREATED
FOR EXTRA SERVICE LONGER LIFE

THE DELTABESTON LINE IS COMPLETE

MAGNET WIRE • POWER CABLE • MOTOR LEAD CABLE
ELEVATOR CONTROL CABLE • FIXTURE WIRE
SWITCHBOARD WIRE • CONTROL CABLE • STOVE WIRE

GENERAL ELECTRIC

DELTABESTON WIRE AND CABLE

APPLIANCE AND MERCHANDISE DEPARTMENT, GENERAL ELECTRIC COMPANY, BRIDGEPORT, CONNECTICUT

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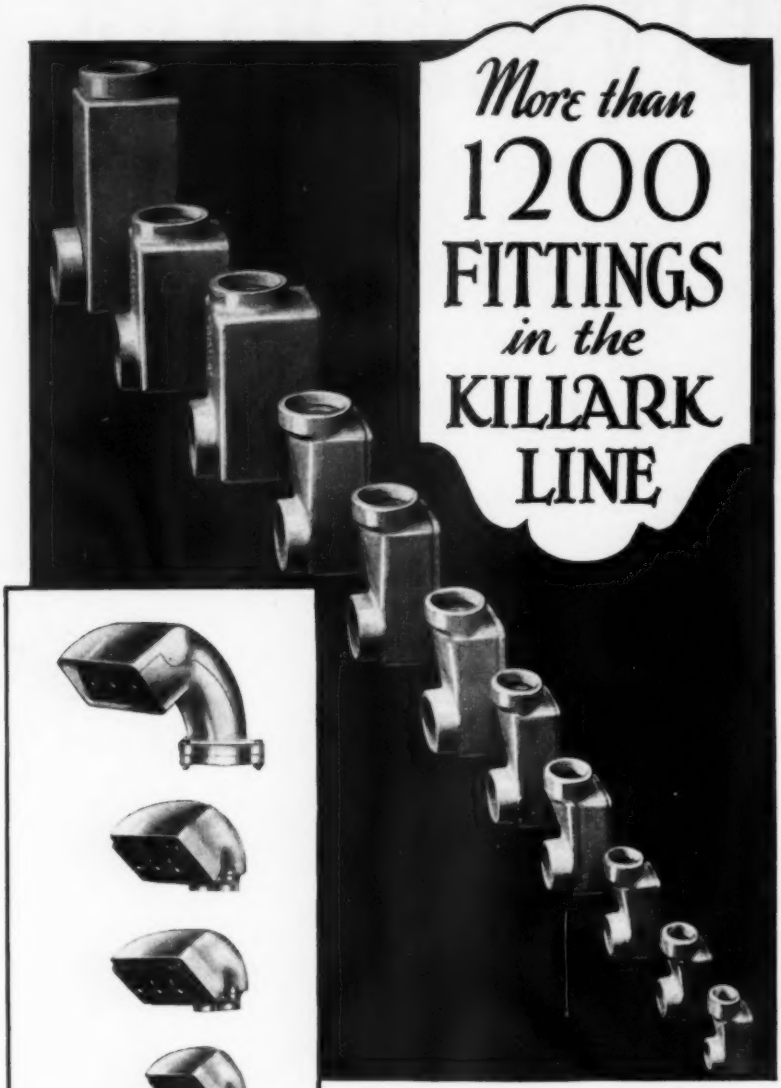
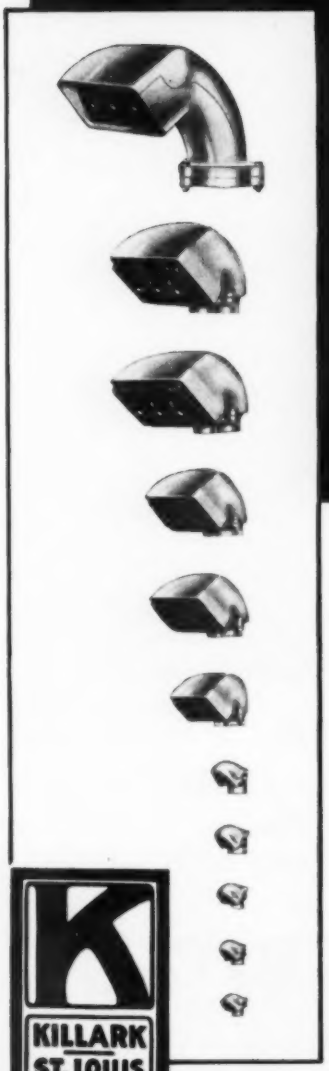




Think what a wide variety of installation problems can be answered in a line with this many fittings, each one modeled and designed for a practical purpose. Into each one, too, has been built that engineering precision and beauty so common to the Killark line. Using them will convince you as it has thousands of others that no better line is made.

A Wide and Wise Selection

Eliminate once for all the stubborn cases of installation by acquainting yourself with this extensive line. You will be convinced of their complete practicability and durability.

Get Catalogue for Full Line — It's Free

We have all ready for you a comprehensive catalogue of the Killark line — including prices, styles and sizes. Write for yours today.

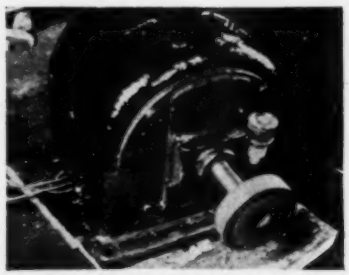
Killark Electric Manufacturing Co.
3140 EASTON AVENUE
ST. LOUIS, MO.

KILLARK
ST. LOUIS

Motor Shops

[FROM PAGE 30]

equipped with two Speedway oilers, after it had been giving considerable trouble. The oil level had been kept too high in the reservoir, so that it worked



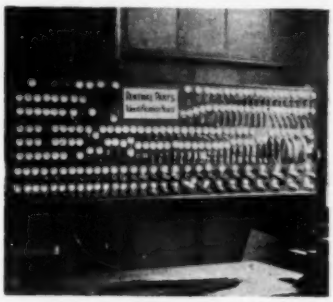
LUBRICATION CORRECTED— Oilers for motor prevent mistakes in maintenance.

out and saturated the windings. With the new oilers, Mr. Wood claims regular lubrication for the bearings and longer service for the motor.

PARTS IDENTIFICATION

Customers calling at the Scherer Electric Company of Indianapolis, Ind. for renewal parts are not held up by an extensive search of catalogs to find the part wanted.

A large display board with samples



RENEWAL PARTS—Are displayed and numbered for quick comparison with customers sample.

of 200 motor and control parts regularly carried in stock has each item tagged and numbered for quick identification. Samples brought in by the customer can also be compared with those on the board for duplication.

ADJUSTABLE ARMATURE STANDS

Sliding V supports for heavy armatures are mounted on an adjustable pipe frame at the Schulz & Ingram, Inc.,

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REDUCE BLOWING OF FUSES ON LOADED CIRCUITS

—and do it Safely!

You can load an ordinary circuit right up to capacity and yet protect it with a 15 ampere Fustat. Its long time-lag keeps it from opening on starting currents that would blow even a 30 ampere fuse — yet the Fustat will open in plenty of time to protect against any dangerous overload. Thus you get safety without useless shutdowns.

Stop loss of time and money on needless "blown-fuse" service calls

When a fuse blows needlessly on a starting current — everybody loses. The user loses time and temper and often money thru having appliances or machines at a standstill.

The service or maintenance man loses because he is pulled away from regular work just to replace a fuse.

The dealer or contractor loses because customers often kick when a full price is charged for a call where the only thing done was to replace a fuse.

The whole electrical industry loses because such needless interruptions of service are costly, annoying and *unnecessary*.

The Fustat stops all this senseless waste by eliminating "false alarm" fuse blows.

Hazardous burnouts of flexible cords prevented — in spite of long time-lag

The Fustat contains a fuse. The ability of a fuse to protect against *dangerous* cord shorts, grounded sockets, etc., is well known.

When such dangerous shorts occur, the Fustat prevents spraying of molten metal, starting of fires, burning of users.

and more . . .

Make SAFE protection REMAIN SAFE

Unlike ordinary fuses, the Fustat cannot be replaced with a penny or other substitutes for the fuse — or with a size too large to protect.

In fact, side-tracking the Fustat in any way is practically impossible without destroying the Fustat or adapter and thereby showing the user that his protection is gone.

User cannot be robbed of protection

The Fustat protects the user against anyone unwittingly creating a fire or personal injury risk thru haphazard practices.

Only a willful and deliberate attempt can destroy protection when a Fustat is used.

The Fustat fits present fuse holders

Thru the use of an inexpensive adapter, the Fustat fits any standard Edison base fuse holder. The adapter screws in like a fuse and locks in place. The Fustat may be changed in the regular manner.

On new jobs, when buying panels, switches, etc., you can specify that they be equipped with Fustat bases.

BE POCKETBOOK WISE — FOR CIRCUIT PROTECTION USE

The FUSTAT

Retails at 7½¢ in 15 to 30 amp. sizes

Write for full information to any of the undersigned

BUSSMANN MFG. CO.
University at Jefferson
St. Louis, Mo.

KIRKMAN ENG. CORP.
121 Sixth Ave.
New York City

NATIONAL ELEC. PDTS. CORP.
Fulton Bldg.
Pittsburgh, Pa.

UNION INSULATING CO.
277 Broadway
New York City

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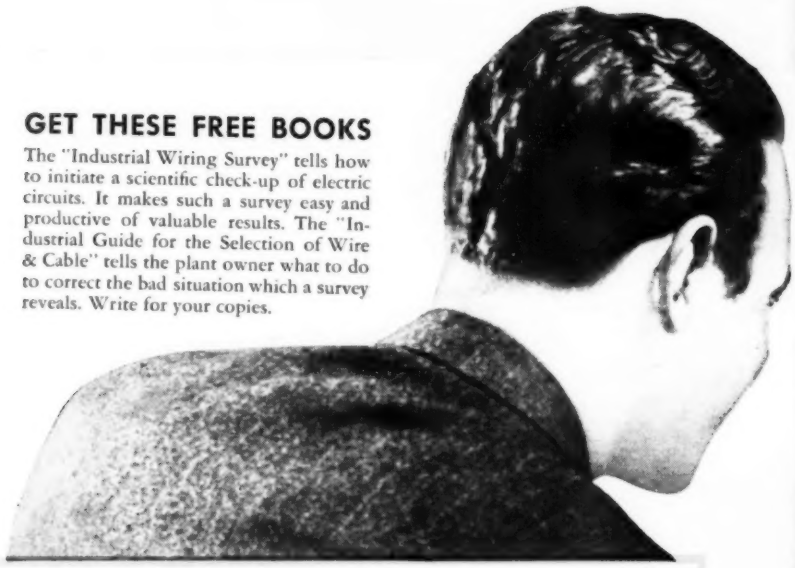
Why not put on your own

GET THESE FREE BOOKS

The "Industrial Wiring Survey" tells how to initiate a scientific check-up of electric circuits. It makes such a survey easy and productive of valuable results. The "Industrial Guide for the Selection of Wire & Cable" tells the plant owner what to do to correct the bad situation which a survey reveals. Write for your copies.



You'd turn off a dripping faucet

—why not stop invisible electrical leaks?

It paid Pepperell to replace antiquated, deficient electric wiring

With approximately 2,000 motors in the plant of Pepperell Mfg. Co. at Lindale, Ga., burn-outs have been so reduced by installing over-size feeders that in five years there has not been a single case of rewinding on a spinning frame, loom, or card-room motor because of overload. The practice of installing over-size feeders a good insurance and saves on power bills, says Comer Taylor, Mechanical Superintendent, yet it involved only a small additional investment since labor cost is the same. We design feed lines for a load from 50% to 100% greater than immediate requirements.

Neglecting electrical circuits costs factory owners thousands in breakdowns . . . high power bills

YOU can see a faucet dripping. But an overloaded electric circuit may be wasting money in the form of heat losses without your ever knowing it. Only the treasurer, wondering why bills are so high, suspects that something must be wrong.

Heat losses are but one way in which dollars fly out the window needlessly when electrical circuits are neglected. Frequent breakdowns are another. Men and machines stand around idle. Or, voltage drops reduce machine output. Lumped together, the damages the industrial plant suffers for antiquated, deficient wiring are often enormous. And authorities estimate that *nine out of ten industrial plants today are being penalized because of obsolete electric wiring!*

Outstanding characteristics of this Anaconda cable are: 1. Its remarkable stability. This has been demonstrated by tests as well as by use in the field. 2. The compound is highly resistant to moisture, acids and alkalies. 3. Low susceptibility to combustion and explosion. 4. Its heat-resisting characteristics permit large emergency overloads.

Write for data on Duracode

Safeguard your plant

A wiring survey will cost you nothing and may save you thousands of dollars. We offer here a complete plan for such a survey. The books shown at right give you everything you need to initiate a check-up of your plant's circuits. New, informative, they are being used by hundreds of manufacturers. Send for them today.

If you have a specific problem in mind, consult our Engineering Department. We will cooperate without obligation. Why not take advantage of the many important improvements in cable design pioneered by Anaconda Wire & Cable Co.? Let us tell you about them.

FREE! The "Industrial Wiring Survey" tells how to make a check-up of electrical circuits. The "Industrial Guide for the Selection of Wire & Cable" tells how to correct conditions found. Both books will be sent free, on

Anaconda Wire & Cable Company

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Sales Offices in Principal Cities

ANACONDA

Anaconda Wire & Cable

General Offices: 25 BROADWAY, NEW YORK • Chicago Office: 20 NORTH WACKER DRIVE

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n Modernize Wiring" Campaign?

This advertisement is one of a series addressed to the industrial executive. It appears in Time, Business Week, and a large number of industrial magazines.

These messages, suitable for use in newspapers, direct-mail advertising or your own company publication, are being used by utility companies to interest manufacturers.

A number of utilities are finding it profitable . . . Anaconda will supply booklets, ads, other materials

SINCE the Anaconda "Modernize Wiring" program got under way a little over a year ago, many utilities have found it profitable to cooperate. We believe the movement is just gaining momentum.

One utility company which carried on a "modernize wiring" campaign developed over 450 leads. These were followed up by the power salesman in cooperation with the local wholesaler and electrical contractors. A number of new lighting and power installations were obtained, as well as numerous re-wiring jobs.

The two books shown here outline a definite approach for your salesmen. Costly losses now being suffered by industrial plants can be revealed by means of a *wiring survey*. These books show how to make that survey. They also show what to do to remedy the conditions found.

This program is sound economics. When an industrial plant gets full value for the power it buys, it will soon be in the market for more power. Use these books as a "door opener" to interest the industrial plants in your locality in an electrical modernization program. We will assist you by supplying books, forms for sales letters, material for ads, and complete directions for carrying on a campaign. A number of utilities are making use of our materials, why not you?

An Anaconda representative will be glad to discuss this program with you. 37558

Use this coupon if you prefer

ANACONDA WIRE & CABLE CO.
25 Broadway, New York City

We should like a copy of your books and outline for a campaign.

Signed.....

Street.....

City..... *State*.....

e Company

ANACONDA

Sales Offices in Principal Cities

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AN EASY WAY

to do a Good Job

WITH APPLETON "35 LINE" UNILETS

Threaded type in all popular styles

No-Thread type in all popular styles

• Why not save time and money through the convenience of installation of Appleton "35 Line" Unilets. The absence of ear lugs and the rounded ends of the cover opening give you more wiring space, and make a quicker and easier job.

Appleton Unilets are made of malleable iron—giving strength yet lightness in weight. The cadmium finish provides positive resistance to rust and corrosion.

Write for further information.

Sold Through Wholesalers

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NEW YORK: 76 Ninth Avenue DETROIT: 7310 Woodward Ave.
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LOS ANGELES: 340 Azusa St. ATLANTA: 203 Luckie St. N.W.

APPLETON

Threaded and No-Thread Malleable

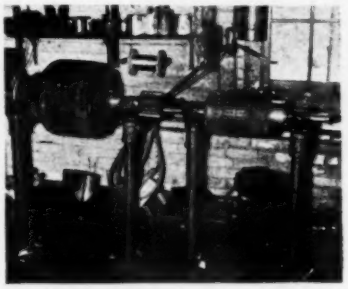
Standard for Better Wiring **UNILETS**

Reg. U. S. Pat. Off.

Motor Shops

[FROM PAGE 32]

motor shop in New Haven, Conn. Flanges at the base of the 2½-in. vertical pipe supports rest on the floor. A pipe tee at the top takes the V-type shaft



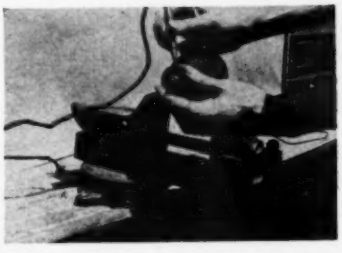
WALL-BRACED STANDS—Sliding tees for wall braces connect to a pipe rail, for easy adjustment.

holder and 30-in. braces extend back to sliding tees which telescope a horizontal 2-in. pipe rail along the wall. The pipe rail is 8-ft. long and is fastened to the wall at both ends with elbows and flanges.

The armature supports may be quickly moved along the rail to accommodate large armatures of any shaft length. A chain hoist above facilitates placing armatures on the stands.

TEST-WIRED VISE

A low-voltage connection made to one of the mounting bolts of a bench vise, for testing armatures and other apparatus held by the vise jaws, is an idea from W. C. Wilhite, Carlinville, Ill. One side of the testing circuit is connected to a terminal post that is part of a brass strap clamped by the vise bolt. The other side or conductor of



VISE TESTER—Low voltage circuit connected to bench vise for quick tests of grounded windings.

the circuit employs a regular flexible lead and an insulating testing electrode. Tests can be easily made of equipment which is suspected of having grounded windings. When the vise is needed for regular bench work, the electrical connection in no way interferes.

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ELECTRICAL

Maintenance

INDUSTRIAL AND COMMERCIAL

A Look at POWER FACTOR CORRECTION

By C. W. DRAKE
Industrial Engineer,
Westinghouse Elec. & Mfg. Company

PRACTICALLY NO MAINTENANCE

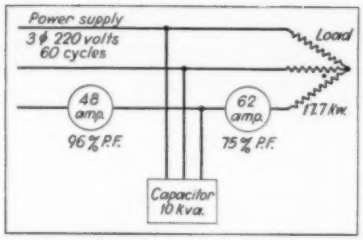
This bank of 60.5 kva. capacitors in a Pittsburgh newspaper plant was completely submerged in the 1936 flood. When the water went down they were merely wiped dry and put back in service.

POWER factor is the ratio of "true" power to "apparent" power. The latter includes the power required for magnetizing an a.c. device such as a motor. True power is measured by a wattmeter, and is expressed in kw. Apparent power is measured by a voltmeter and ammeter, and is usually expressed in kva. Thus, p.f. = kw/kva. It is expressed in per cent, and is said to be unity (100 per cent) when the current and voltage are "in phase," that is, when the alternating current and voltage go through their peaks at the same time.

"Low power factor" is a comparative term. As a rule, power factor is said to be low when it is below 85 per cent. Most power companies make a penalty charge for poor power factor.

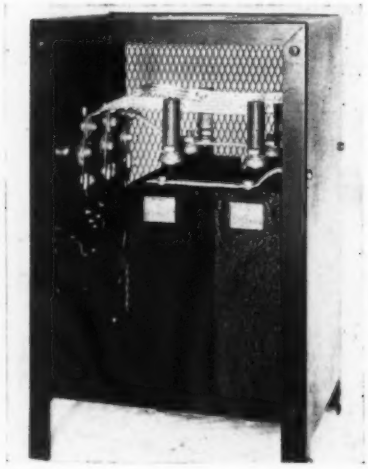
In most a.c. systems, power factor is "lagging" because the a.c. current reaches its peaks slightly *behind* the voltage. To correct this condition, capacitors can be added to the system. These devices possess the property of "capacitance" which causes a.c. current to go through its peaks *ahead* of the voltage impressed upon them, thereby counteracting the lagging current of the usual a.c. load, and improving the power factor of the system as a whole.

Capacitor units usually consist of

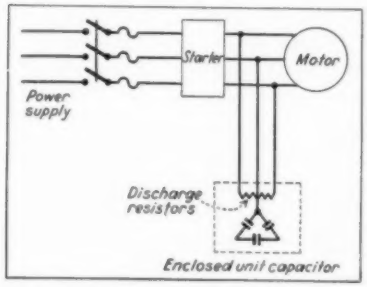


THE CURE—Diagram of feeder power-factor correction.

THE CASE—Standard 15-kva, 3-phase, 460-volt inclosed unit capacitor, complete.



THE WORKS—Standard 30-kva, 3-phase, 460-volt indoor small rack-type capacitor equipment with one side screen removed to show internal construction.



THE WIRING—Diagram of connections for individual capacitor across motor terminals; no switch or circuit breaker is required.

parallel sheets of aluminum foil separated by thin paper, enclosed under an impregnating fluid in a welded steel box; leads from the foil sheets are fastened to terminals outside of the box.

Where Low Power Factor Occurs

Although induction motors account for most conditions of low power factor, any devices using a special high-reactance transformer, such as spot welders, gaseous-tube lamps and the like, have very low power factor. On the other hand, the usual incandescent lamps, resistance-type heaters, and heating devices operate at approximately unity power factor, and so tend to improve plant power factor.

In all constant-speed motors, the excitation requirements are approximately constant regardless of load, and therefore as the load decreases, power factor becomes lower. Thus, although power factor is a natural occurrence, a very low power factor indicates abnormal operating conditions which should be investigated.

How to Find the Power Factor

If, during the period of maximum load, numerous meter readings are taken of volts, amperes, and kilowatts, the power factor and maximum demand are readily obtained.

In a 3-phase system, the kva $= \frac{1.73 \times \text{amp} \times \text{volts}}{1{,}000}$ and the power factor is $\frac{\text{kw. (as measured)}}{\text{kva.}}$

If an indicating or curve-drawing wattmeter is not available, satisfactory results may sometimes be obtained with a totalizing watthour meter, providing it may be read with reasonable accuracy over a period of 15 or 30 minutes. In this case, the kva. would be obtained as before by means of a voltmeter and ammeter, and the kw. obtained by multiplying the 15-min. readings by four, or the 30-min. readings by two.

Calculations required to find the amount of corrective kva. needed to raise the power factor to any desired higher value are rather complicated, but they have been replaced by the simple chart in the accompanying "Guide Sheet."

Where to Put Capacitors

If located near the incoming line or main bus, capacitors will correct the power factor and reduce the power charges as determined by the calculations. But since capacitors are unit construction, they may be assembled in smaller groups or units with very little difference in price.

Except in very small plants, there are generally certain departments or groups of motors at a considerable distance from the main switchboard, and the voltage regulation at these remote locations is often far from satisfactory. Consequently the load conditions on the feeders in the various departments should be studied.

Load and power factor tests on feeders may be made at the switchboard or panelboard in the same manner as for the total load, and in carrying out this work, permanently assembled testing equipment (industrial analyzers) will be found to save much time and expense.

Some feeders will be found to have light loads with high power factor—as, for example, circuits composed mostly of lighting—while others will be heavily loaded with low power factor. Thus the source of the low plant power factor can be quickly determined and segregated.

If the wiring is in good shape, but certain feeders are overloaded or have a long run with a low motor voltage, there is a good opportunity to improve conditions by installing capacitor units near the load centers on the various feeders.

The total kva. of capacitors installed should be approximately as determined by the total power factor calculations, but the distribution on the feeders should be approximately in proportion to their load and power factor. The power factor on these feeders with capacitors will be higher than the plant average in order to make up for the lower power factor on the uncorrected feeders.

An Example Worked Out

A 10-kva. capacitor is connected to a feeder (illustrated) carrying a load of 62 amp., 3-phase, 220-volt, 60-cycle—23.6 kva. and 75 per cent power factor. This capacitor improves power factor to approximately 96 per cent, reducing line current from 62 to 48 amp. Voltage drop will be reduced in proportion to the current, and will be 48/62 or 78 per cent of the original value. Energy loss will be reduced by the square of the current, to approximately 60 per cent of the original loss.

How to Connect Capacitors

Individual inclosed unit capacitors in sizes up to 15 kva., 460 volts, (illustrated), may be connected across the motor terminals, and thus disconnected with the motor switch. They may also be connected to the feeders with a suitable fused switch or circuit breaker. Discharge resistors within the inclosure reduce the voltage across the terminals to a safe value for maintenance within a minute after being disconnected from the line.

When a larger corrective capacity at one place is required, the individual

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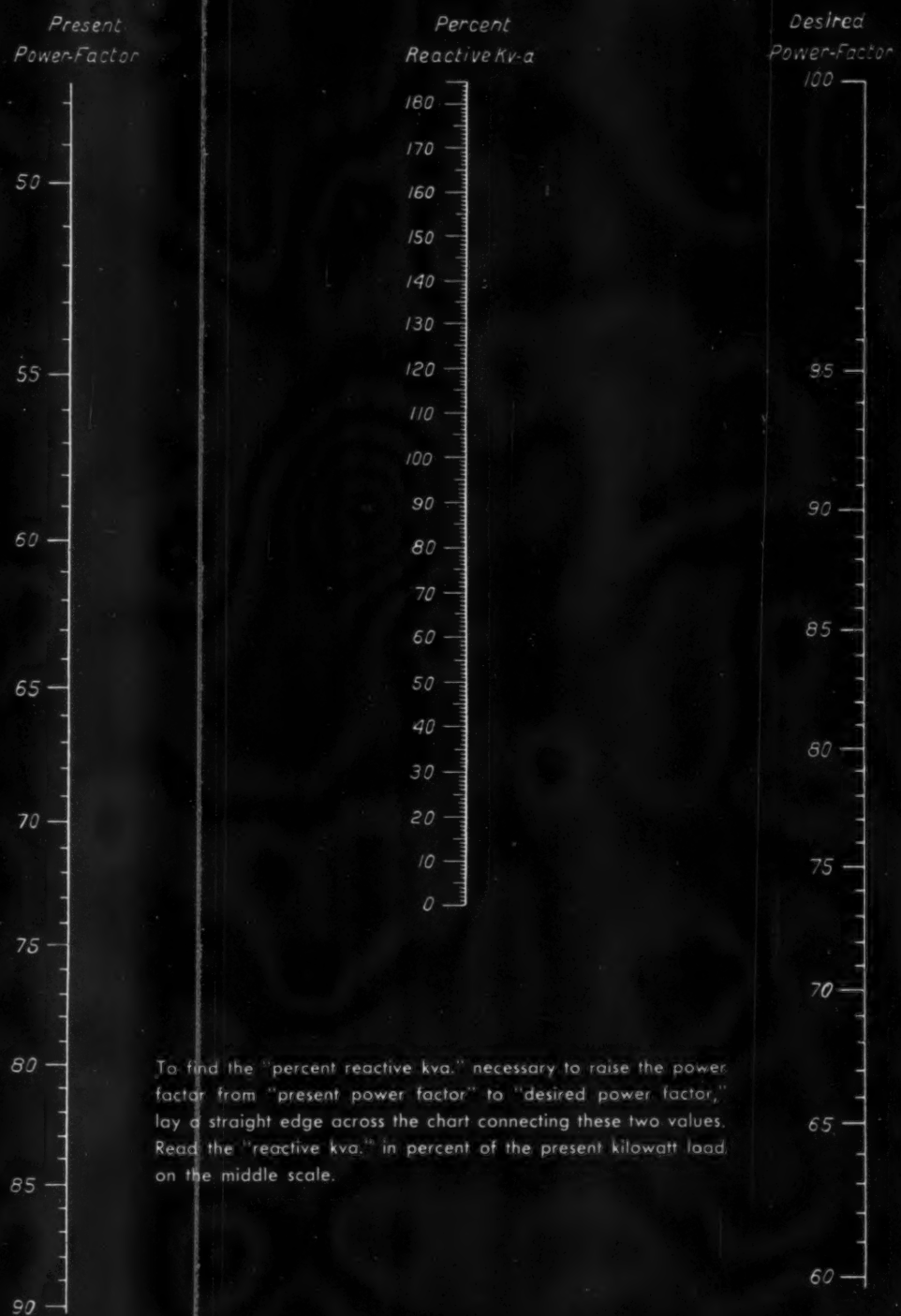
ELECTRICAL MAINTENANCE GUIDE SHEET

How to Raise Present Power Factor to Any Desired Value



To find the "percent reactive kva." necessary to raise the power factor from "present power factor" to "desired power factor," lay a straight edge across the chart connecting these two values. Read the "reactive kva." in percent of the present kilowatt load on the middle scale.

units may be grouped in a bank. Conduit wired together or small rack-type assemblies as illustrated may be used. The rack-type assemblies can be supplied with or without circuit breakers, and individual units may be protected with boric acid fuses, so that a fault in one unit immediately isolates that section of the assembly.

Capacitor units are hermetically sealed in welded steel cases, and because they are impregnated with a non-inflammable liquid, they constitute no fire hazard.

Maintenance of Capacitors

When properly installed, capacitors require practically no maintenance, except that they must be inspected from time to time, to see that they are still on the line—that is, the circuit breaker must be closed and no fuses blown.

As a matter of good housekeeping, it is desirable to provide for periodic cleaning of the units, and if atmospheric conditions are severe, repainting may be necessary after a time.

Replacement of Motors For Reversing

When a production machine is shut down because of motor trouble, it is sometimes necessary for the maintenance man to put on another motor. Before making the replacement, either temporary or permanent, the duty cycle for the motor should be determined. This is particularly necessary if the operation of the machine, such as a machine tool, requires a motor to be run in opposite directions. Reversing service will cause a motor to heat more quickly than if it is run continuously in one direction.

Almost any of the standard constant-speed motors are good for normal reversing duty. However, for rapid reversing duty special construction is necessary. Prior to replacement, the maintenance man should consult with the motor manufacturer to learn if the motor is suitable for the reversing service for which it is intended.

Cleaning Materials

From a recent nationwide survey made by the McGraw Hill Publishing Company on industrial cleaning supplies, 29 individual products are listed as being used most frequently, ranging from soap and chemicals, through abrasives and files, to hose, brushes, cloth, and waste.

The materials are listed for 23 uses such as cleaning boilers, trucks, metals, motors, fabrics, hands, glass, woodwork, drains, and other things, as well as degreasing, rust removing, finishing, plating and polishing.

A recapitulation of the various cleaning items discloses fourteen materials are used for motors, and the percentage of each used by all industries reporting.

Cleaning Material	*Per Cent*
Carbon Tetrachloride	19
Abrasive Papers and Cloths	9½
Kerosene	7
Rag Wipers	6
Waste	5
Solvent Naptha	4
Abrasive Grains and Powders	3
Files and Rasps	3
Soap	3
Bench and Machinery Brushes	2
Grinding Wheels	2
Steel Wool	2
Trisodium Phosphate	1
Wire Brushes	1

No Interruptions, Please!

To meet the requirements of increased business, the Archer-Daniels Midland Co., large manufacturer of vegetable oil, has assured continuous service by modernizing the switchgear at its Edgewater, N. J. plant, according to William A. Foley, plant engineer. The new switchgear installation includes nineteen General Electric metal-enclosed cubicle units. In addition, six large power transformers and four Pyranol-filled capacitor racks have been installed to increase capacity and maintain power factor.

The plant operates on a 24-hour day basis and electric service is required for conveyors, presses, heddles, and allied applications. Total connected load is 6,308 hp., of which 2,257 hp. was formerly connected to a revamped switchboard originally installed in 1912. The old switchboard panels were of the conventional vertical type, slate, with live parts exposed on the front. Mounted on the rear of the board, which served twelve plant departments, were oil circuit breakers, pushbuttons, connection, and instrument transformers—all exposed to external contact. There was no provision for isolating the oil circuit breakers.

Because the plant had outgrown the normal capacity and interrupting ratings of the oil circuit breakers, there was a constant threat of service interruption. Fire insurance rates and maintenance costs were high.

On the new switchboard the incoming and feeder equipments are en-

MIKE'S MAINTENANCE MANUAL

"A Tight Brush Is Nothing To Chatter About"

By J. M. Zimmerman
Service Division, Westinghouse Electric & Manufacturing Company, Chicago, Ill.

NEXT to mica slivers, tight brushes in the holder may be classed as the most common cause of commutator difficulties. This condition can be remedied by the following suggestions:

1. A new set of brushes should have a clearance on the width of minus 0.001 to a minus 0.016 of an inch, and a thickness of minus 0.001 to a minus 0.004.
2. Do not permit leaks from the roof over the commutator or slip rings.
3. Do not allow oil, dust or dirt to collect around the brush holders or commutating unit.
4. Keep all brush pressure adjusted evenly.
5. Every week all brushes should be moved in their holders to make sure they do not stick.
6. Every month each brush should be removed from the holder to allow any dirt which may exist between the brush and the holder to fall out.
7. Keep all brush holders within ⅛ in. from the commutator or slip rings to give smooth riding.
8. On d.c. machines, the brush holder bracket arm and brush holders must be within 1/32 in. in a parallel line with the commutator bars.
9. If the motor operates in a very dusty place make an "X" shape slot on each side of the brush. This slot will catch the dust particles and let them work to the bottom of the holder.

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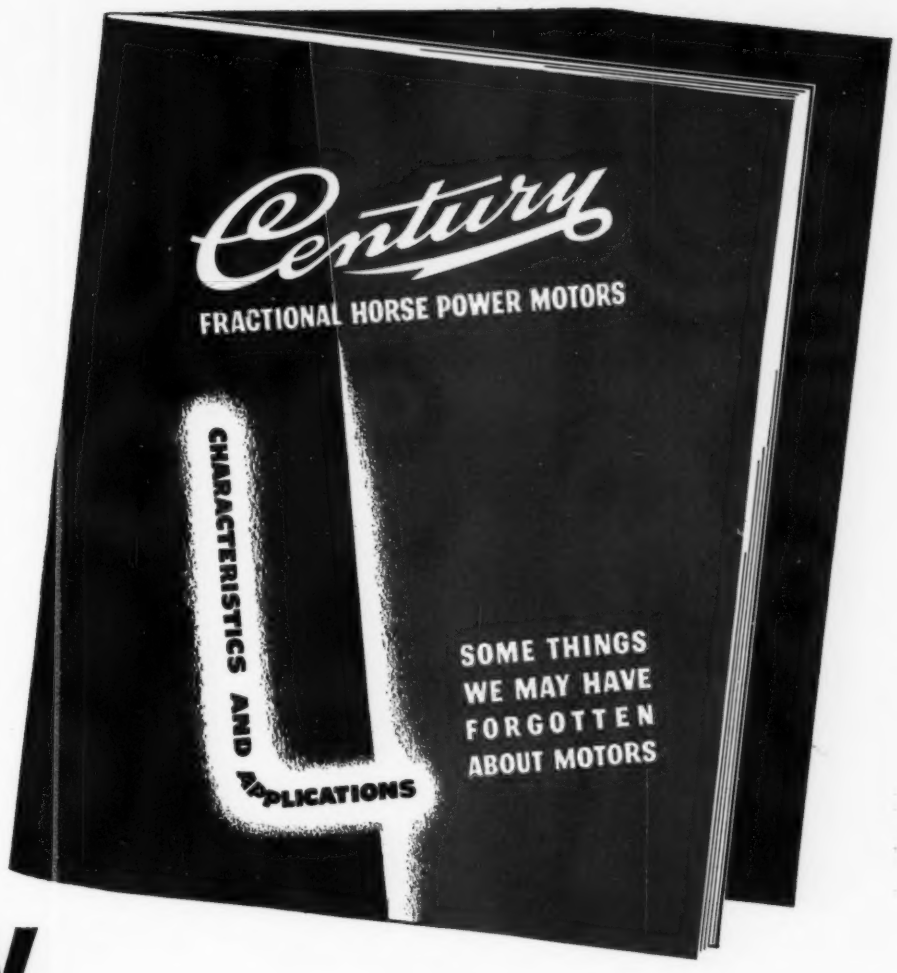
Century
FRACTIONAL HORSE POWER MOTORS
CHARACTERISTICS AND APPLICATIONS
SOME THINGS WE MAY HAVE FORGOTTEN ABOUT MOTORS

THIS BOOK *tells..*

HOW *to* SELECT *the* RIGHT MOTOR

This New 24-page book will be of real assistance to you . . . Here is presented in helpful form information concerning the electrical characteristics of all types of Fractional Horse Power Motors—and suggestions as to how they can be most effectively applied to meet the requirements of motor-driven machinery and appliances operating in normal or abnormal surroundings . . . Fully illustrated . . . Send for your copy, if you have not received it . . . **ASK FOR BULLETIN 1039-R . . .**

CENTURY ELECTRIC COMPANY

1806 Pine Street • • • • St. Louis, Mo.

Offices and Stock Points in Principal Cities

Century MOTORS

UP TO 600 HORSE POWER

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closed in separate units. This provides flexibility by localizing departmental shutdowns, and permits men to work on the equipment in safety.

The high-tension board consists of two 2,400-volt incoming line cubicles, and the low-voltage end has 17 cubicles, two of which are blank panels provided for feature circuits and metering. No live parts are exposed. In each cubicle,

CUBICLE SWITCHBOARD — Incoming and feeder equipment each enclosed in a separate unit.

group-operated disconnecting switches are provided between the oil circuit breakers and the bus bar. These disconnecting switches are mechanically interlocked with the oil circuit breakers and hinged doors. Thus, access to the inside of each cubicle can be gained only when the disconnecting switches are opened, and the disconnecting switches can be opened only after the breakers have been opened.

The complete changeover was accomplished in 32 hours. The work was done entirely by the foreman, three electricians and three helpers of the regular plant electrical staff.

Maintenance costs are expected to be decreased considerably. There already has been a substantial reduction in fire insurance rates. Safety, of course, has been greatly increased.

Tank Alarm Systems —11 Check Points

Tank alarm systems are made up in different ways, the chief variation being in the type of control apparatus. In most cases, these systems are used in connection with tanks to indicate when liquids have reached a high or a low level or both.

In the following suggestions for taking care of troubles in these alarm circuits, the thought has been to cover the open-circuit system, used with water supply tanks in buildings and institutions as well as many industrial processes. Other tank alarm systems used in connection with standpipe and sprinkler alarms are not covered at this time.

A—When audible and visual signals fail to operate.

1. Check for weak battery, blown fuses, or defective transformer.
2. Examine contact springs in tank float switch. These usually require frequent cleaning.
3. On manual switch type, examine double-throw knife or rotary switches on panel for defective contact between switch blade and jaws. Also check to see that switches are thrown over to proper position as required for "high" or "low."
4. On relay type, examine relay contact springs and connections to relay coils.
5. Adjust audible signals and check for loose connections.
6. Examine pilot signal for loose or defective lamp, faulty lamp receptacle, or loose connection to receptacle.

B—When pilot lights fail and alarm bell operates.

7. If pilot lamps are connected to "high" and "low" section wires, examine for loose or defective lamp, faulty lamp receptacle, or loose connections to receptacle.
8. If pilot lamp is connected through contacts of relay, examine contact springs of relay, loose or defective lamp, faulty lamp receptacle, or loose connections to receptacle.

C—When audible signal fails and pilot light operates.

9. On manual switch type, examine double-throw knife or rotary switch on panel, for defective contact between switch blade and jaws. Also check to see that switches are thrown over to proper position, as required for "high" or "low."
10. On relay type, examine relay contact springs.
11. Adjust audible signal and check for loose connections to it.

Eliminates Faulty Shipments

Considerable trouble with breakage of watch crystals after shipment to customers was experienced by the Acme Watch Crystal Manufacturing Co., New York City. A specially designed electrically heated furnace for annealing the crystals eliminated this problem.

A charge of watch crystals placed in the furnace cold is brought up to a temperature between 800 and 900 deg. F. in about two hours. At the end of

Three "Danger Spots" in Motor Operation

Check Load	Danger Condition	What to Do
Intermittent Overloads	Ordinary overload relay, designed to operate on stalled condition or on continuous overload, will not protect motor	If motor overheats, see if peak loads can be made less frequent; if not, install motor of larger capacity
Temperature of Surrounding Air Excessive	Motor temperature rises, but there is no increase in load current to operate ordinary protective relay	Ventilate vicinity of motor; use temperature-protective device in motor windings
Driven Machine Hard to Start, or Started and Stopped Too Frequently	Current peaks at start build up excessive temperatures, damaging insulation	Make sure that motor of proper starting characteristics is used; caution machine operator

UMI

THE CHISELER

Chiseled!

CLARK ENGINEERING FOILS THE PERSISTENT EFFORTS OF WEAR TO SHORTEN THE LIFE OF CONTACTS

WEAR, little demon that he is, finds himself thwarted in every attempt he makes to destroy the Clark Contactor. He discovers to his chagrin that:

1. The arc shield is made of Carborax, practically impervious to arcing and heat.
2. The blow-out coil has more turns and a larger cross section. Result: greater magnetic effect and increased carrying capacity.
3. The blow-out coil is fastened securely to the terminal studs by Everdur bolts, which have approximately the same coefficient of expansion as copper.
4. The movable contact arm and main arm turn on renewable Nitralloy pins surrounded by renewable Nitralloy bushings—"Nitralloy to Nitralloy"—minimizing wear. Easily adjusted to maintain correct contact pressure.

The Clark 300-ampere, single-pole contactor. Observe how in this trim, business-like Clark unit cotter pins have been eliminated in both Movable Contact Arm and Main Arm. At all pivotal points—wherever there is relative motion—renewable Nitralloy pins and renewable Nitralloy bushings have been installed. The same features are found in the 100-, 150-, and 600-ampere contactors.

THE CLARK CONTROLLER COMPANY

[illegible] EAST 193rd STREET CLEVELAND, OHIO

NO OTHER RACEWAY FOR WIRING CAN GIVE YOU *all* THESE FEATURES

- Cold-Rolled Open-Hearth Steel
- 100% Electric Resistance Weld
- Adequate Protection
- Light Weight
- Easy to Cut
- Easy to Bend and Rebend
- No Threads
- 3 Simple Fittings
- Knurled Inside Surface
- Uniform Corrosion-Resistance
- Easy to Install
- Universal Acceptance
- Low Cost
- Widespread Distribution
- Assistance of a Field Force

Good-By

ELECTRUNITE Steeltubes

Reg. U. S. Pat. Off.

MORE THAN 150,000,000 FEET INSTALLED

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Threading

....THIS BETTER RACEWAY FOR WIRING IS THREADLESS

Why contend with the nuisance of threading conduit? ELECTRUNITE Steeltubes — the modern, light-weight, rigid conduit — is threadless.

Think of it! No threads to cut, no stocks or dies to buy, no vises, no grease or dirt, no damage to the rust-resisting coating, no cutting away of wall at joints, no weakness that invites fatigue failure. Merely slip on a compression-type fitting and tighten it — and you have a water-tight joint that will not work loose even under vibration.

Ask your wholesaler to send out the Steeltubes man with his "bag of tricks."

THREE SIMPLE FITTINGS — coupling, box connector and adapter — together with a wrench, a hacksaw, a bending tool and ELECTRUNITE Steeltubes are all that is needed for installing a sound, modern, low-cost raceway for wiring.

• • •

Knurled inside finish (Patent No. 1,962,876) available in ½", ¾" and 1" sizes.

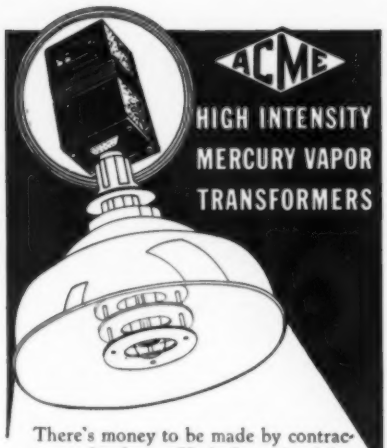
ELECTRICAL DIVISION

Steel and Tubes, *Inc.*

WORLD'S LARGEST PRODUCER OF ELECTRICALLY WELDED TUBING

CLEVELAND . . . . OHIO

SUBSIDIARY OF REPUBLIC STEEL CORPORATION



There's money to be made by contractors who know High Intensity Mercury Vapor lighting. Industrial plants everywhere, need and want this kind of lighting that is better than daylight for assembling and machining operations. But the most important accessory is the transformer. That's why you should know why Acme high intensity M. V. transformers offer greater customer satisfaction and more money in your pocket.

THE ACME ELECTRIC & MFG. CO.
36 Water St. Cuba, N. Y.

Acme ACME Electric
TRANSFORMERS

CONTRACTORS

Get the habit!

Read these valuable departments each month in Electrical Contracting

•
Wiring Methods
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Motor Shops
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Better Lighting
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Questions on the Code
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Questions on Signaling
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this time the current is shut off automatically, and the charge is covered gradually over a period of eighteen hours.

This cylindrical furnace has a heated well 12 in. in diameter and 12 in. high. The cover is designed to reduce radiation and conduction losses to a minimum. A three-heat switch and thermostatic control are provided for temperature regulation.

How to Make Carbon Brushes "Toe the Mark"

Inspection and servicing of carbon brushes were discussed by Mr. L. L. Stoffel, Chief Engineer, The Ohio Carbon Co., in the November issue of Electrical Contracting.

In a continuation of the article the author tells about "selective action" of carbon brushes and gives an example of it.

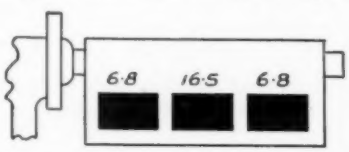
What is "Selective Action"?

The resistance of the brushes and of their contact area on the running commutator forms a large proportion of the total resistance of the internal circuit of the machine. Therefore, any extra resistance—either ohmic or contact—in any brush will cause it to take less current and to compel the other brushes to carry extra load. If the total resistance of one set of brushes, on a single stud, is different from that of the others, matters will be still worse. Then the distribution between the various parallel stud circuits will be changed unequally. Those brushes, which have the lower resistance, will spark and wear excessively, and no amount of rocker adjustment can do much about it.

Perhaps the most extreme case would be where two different grades are being compared by putting different grades on adjacent studs. Such a comparison, of course, may prove nothing at all or it may prove disastrous. The brushes, which take the greater part of the current, will naturally spark, overheat and wear worse than the others—whether they are actually more suitable for the machine or not.

An Example

An extreme case of this sort of thing, but one based on actual experience, is shown in the diagram. Since a certain amount of sparking had been in evidence, the plant maintenance engineer decided to replace them, as they wore down by a different grade of brushes, which had been giving very good results on another similar motor. But he had forgotten that the previous machine had been equipped from the start with a complete set of the type of brushes be substituted on the second motor, one at a time. Within less than two weeks he was in trouble—plenty. The sparking had ceased on the older brushes, but the new ones had sparked so destructively that the commutator was grooved and cut more than a quarter of an inch deep.



***MIS-MATED**—How "Selective Action" takes place among brushes of different grades.*

The brush manufacturer's suggestion that he replace *all* the old brushes with the new ones, seemed absurd. If one or two brushes would destroy the commutator so badly, surely a complete set would be far worse. However, the manufacturer succeeded in convincing him—and naturally enough, the troubles ceased. What had actually happened may be seen. The total current being approximately 30 amperes, each brush had originally been handling 10 amperes. But the contact drop between brush and commutator was 1.25 volts. This meant a contact resistance of 0.125 ohm. The ohmic resistance of the brush itself was about 0.0016 giving a total of 0.1266 ohm. The new brushes had a contact drop of 0.5 volt, an ohmic resistance of about 0.001, or a total resistance of 0.501 ohms. With the relative resistance differing in the ratio of about 2½ to 1, it is easy to see why the old brushes stopped sparking. Practically, they were now doing hardly any work at all—while new brushes were trying to carry most of the load.

Commutator Inspection

Space is not available within this article to deal with the commutator troubles which cause brush troubles. High micas, burning, pitting, glazing, out-of-roundness, and loosening or skewing of the bars can all produce a lot of trouble.

For Fastening Bells to Outlet Boxes

It is often found that bells, buzzers, horns and other audible signaling apparatus will not fit on the standard outlet boxes installed in a building. A simple way to overcome this difficulty is to use an adapter plate, which may be purchased from the manufacturers of the signaling apparatus. Or, one may be made from a flat blank 4 inch square outlet box cover.

The accompanying illustration shows

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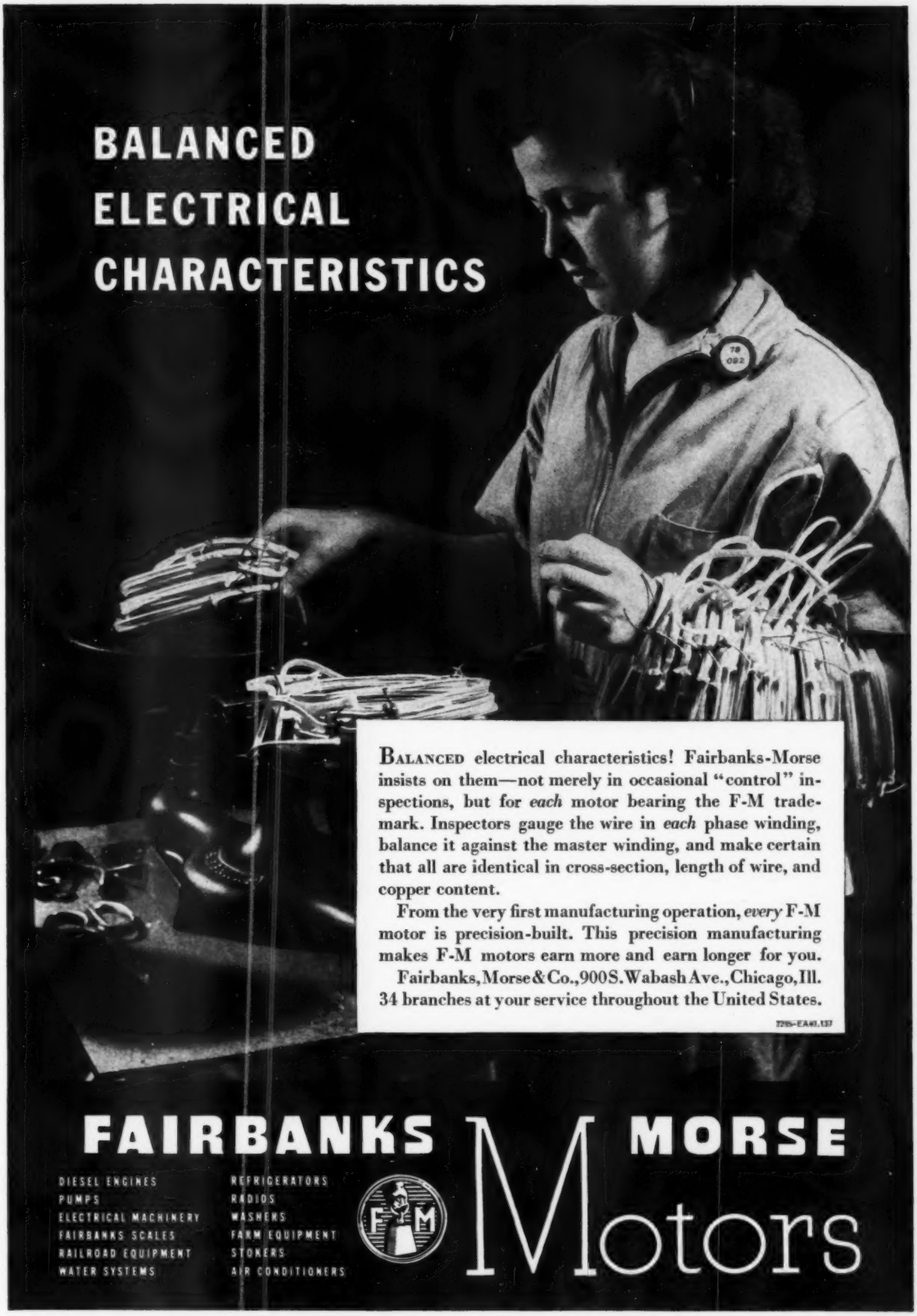

BALANCED electrical characteristics! Fairbanks-Morse insists on them—not merely in occasional "control" inspections, but for *each* motor bearing the F-M trademark. Inspectors gauge the wire in *each* phase winding, balance it against the master winding, and make certain that all are identical in cross-section, length of wire, and copper content.

From the very first manufacturing operation, *every* F-M motor is precision-built. This precision manufacturing makes F-M motors earn more and earn longer for you.

Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill.
34 branches at your service throughout the United States.

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FAIRBANKS MORSE

DIESEL ENGINES
PUMPS
ELECTRICAL MACHINERY
FAIRBANKS SCALES
RAILROAD EQUIPMENT
WATER SYSTEMS
REFRIGERATORS
RADIOS
WASHERS
FARM EQUIPMENT
STOKERS
AIR CONDITIONERS

Motors

PROFIT *with* Wagner Motors

Small Motors

Electrical dealers and contractors can profit by handling a well-known, dependable and complete line of both fractional- and integral-horsepower motors.

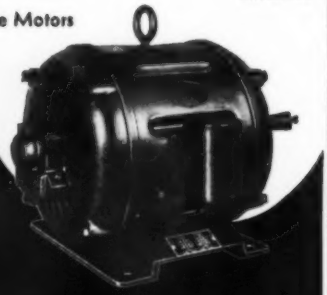
Wagner motors are well-known to both industry and the home. Millions of homes have Wagner-motored refrigerators, oil burners, coal stokers and other appliances giving satisfactory service to their owners. Wagner motors have long been faithfully driving thousands of different applications in industry. The name "Wagner" has therefore developed wide customer acceptance. This means a lot to you—it means that it will require less sales effort on your part to sell and recommend Wagner motors.

In addition, whenever you recommend Wagner motors to your customers, you can give them an absolute assurance that they are guaranteed and will give satisfactory service and trouble-free operation.

Send for catalog and secure full information about Wagner Motors

MM237-1A.

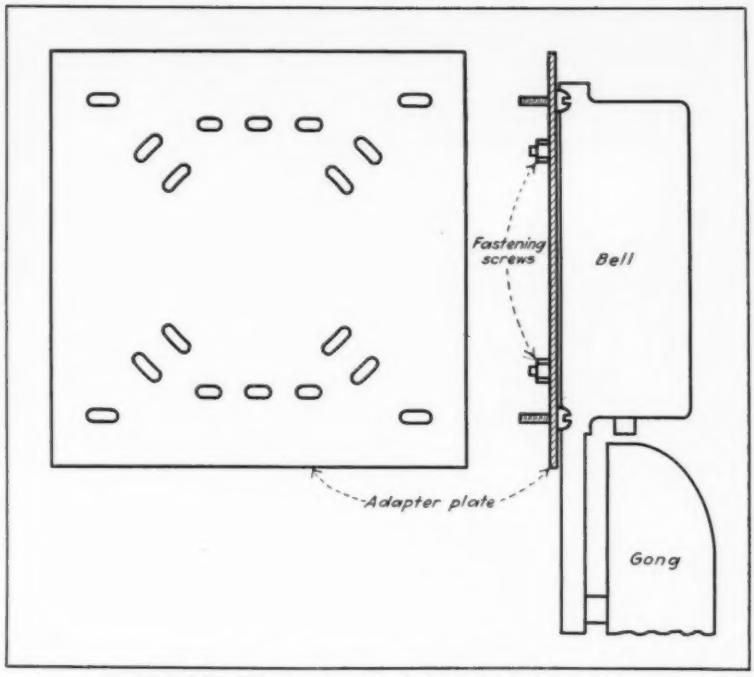
Large Motors



Wagner Electric Corporation

6400 Plymouth Ave., St. Louis, Mo.

MOTORS · FANS · TRANSFORMERS · BRAKES



ADAPTER PLATE—For fastening bells to standard outlet boxes.

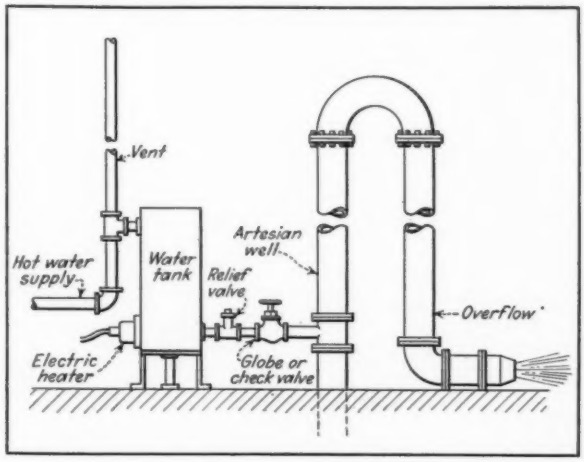
one type of adapter plate arranged to fit single or two-gang outlet boxes or covers, either the so-called 3 inch and 4 inch round, or the 4 inch square outlet boxes. The bell, in the illustration, is fastened to the adapter plate by machine screws and nuts. The adapter plate, in turn, is fastened to the 4 inch square outlet box.

Electric Power Used For Heating Water

One of our acquaintances tell about the use of electric power for heating water. Among the installations mentioned, one type for low pressure water service in Alabama embodies an idea worth passing along.

Overflowing wells are numerous in one section of territory served by the Alabama Power Co. In some localities these artesian wells are the only source of a water supply. The pressure is very low and the wells have not been utilized as a source of supply for a water system, even in the home.

A local engineer realized that if the pipe through which the water flowed was elevated to approximately fifteen feet above the ground, sufficient pressure could be had to give a flow of water through an electric water heater without installing a booster pump. Plans for an installation of this type were worked out with the assistance of a local plumber. An electric immersion



HOT WATER SUPPLY — Electric power heats water from low-pressure artesian well.

Simplify the Winding Job!

SAVE LABOR AND MATERIAL WITH

IRV-O-SLOT

...The most economical and convenient type of insulation for armature slots...Supplied in sheets or strips or cut to slot sizes...It saves both labor and material and simplifies the winding job.

IRV-O-SLOT...is a varnished cambric insulation duplexed with any standard thickness of fibrous insulation. The materials are cemented with a flexible binder that permits shaping without separation of the layers.

STANDARD OF THE WORLD
IRVINGTON INSULATION
TRADE MARK

Write today for prices and samples ... IRV-O-SLOT is most economical.

IRVINGTON VARNISH & INSULATOR CO.
IRVINGTON, NEW JERSEY, U.S.A. *Est.* **1905**

VARNISHED CAMBRIC • VARNISHED CAMBRIC TAPES • IRV-O-SLOT • VARNISHED CANVAS
VARNISHED SILK • FLEXIBLE VARNISHED TUBING • VARNISHES AND COMPOUNDS

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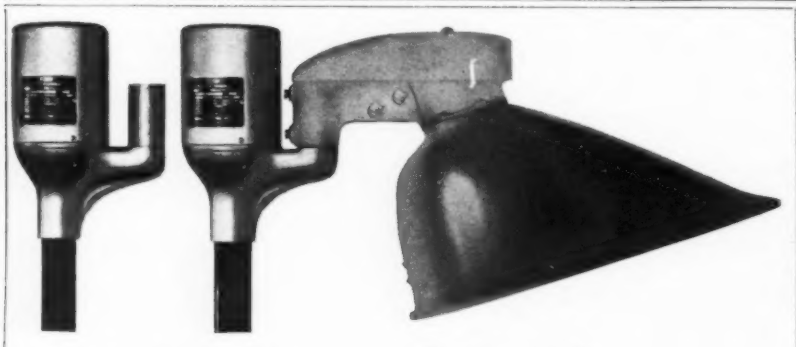
Bunting stock service bearings are made exactly to shaft size with all grooves, holes and correct machine work, ready for immediate assembly

BUNTING Quality assures service replacements that give satisfaction in use. When you put Bunting Bearings into an electric motor you have not only restored the part but in many cases enhanced performance. Write for your copy of the Bunting catalog of Electric Motor Bearings for service replacement in all makes of motors from 1/40 hp to 60 hp . . . The Bunting Brass and Bronze Company, Toledo, Ohio. Branches and Warehouses in All Principal Cities.

BUNTING Quality
BRONZE BUSHINGS • BEARINGS
MACHINED AND CENTERED BRONZE BARS
BABBITT METALS



DONGAN
Pole Top Mercury Lamp
TRANSFORMER

Mercury Vapor the economy light for floodlighting.

The Dongan Pole Top Transformer presents a new method of reaping profits from Mercury Lamps.

Any standard make of reflector with pole top bracket will fit this new type of Dongan Transformer.

- Easy to install.
- Wiring fully enclosed.
- Makes 110 volts available for Mazda lighting of small signs on the side of the pole.
- Dongan built—Quality.

Ask your Electrical Wholesaler or write for prices. Dongan makes a full line of Mercury Lamp Transformers. Also complete lines for Machine Lighting, Signaling, A. C. Arc Welders, Bell Ringers, Electrical Testing, Pipe Thawing . . . Transformers for Neon Signs and Oil Burner Ignition.

"The Dongan Line Since 1909"

DONGAN ELECTRIC MFG. CO.
2985 Franklin Street - - - DETROIT, MICH.

heater was installed near the bottom of the tank. A globe or check valve, depending on the pressure, was installed between the artesian well and water tank.

Housekeeping!

Maintenance and repair departments are integral parts of the plant, and therefore subject to the same inspection as other departments. Here are eight check questions on departmental housekeeping:

1. Are portable tools clean, in their place, and immediately obtainable?
2. Are repair parts neatly arranged in the store room?
3. Are machines clean and ready for the next job?
4. Are machine accessories, tools and dies stored neatly?
5. Are ledges and benches clear?
6. Are all corners tidy?
7. Are all aisles clear?
8. Is the room well swept?

To Keep Switchgear In Trim

The adjoining Du Pont and Nemours buildings, in Wilmington, Del., are inter-connected through a system of 11,000, 2300 and 440-volt feeders. There are numerous cubicles housing truck-type oil circuit breakers, that must be kept in proper operating condition. Periodic tests are made on these breakers by means of a testing rack that was installed in the Nemours building, for this purpose.

***BREAKER SERVICE DEPOT**—Private building provides facilities for testing its truck type oil circuit breakers.*

The general view shows this rack in the center foreground, with special cranks, wrenches, multi-pole jumper cables and other appurtenances hung on wall brackets, in the left background. At the right, are two remote-controlled 2300-volt oil circuit breaker cubicles. These are located just outside the wire-mesh enclosure for a 2,000-kva. bank of 11,000/2300 volt pyranol transformers.

In the close-up view of the test rack,

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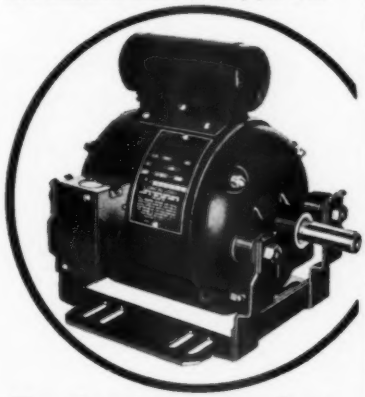
Two NEW MOTORS by Peerless

Backed by years of experience in meeting the needs of motors for general and special applications, Peerless introduces two motors.

Splash Proof

Single and polyphase motors with special hood construction permitting ventilation but excluding moisture. These motors are suitable for use in dairies, pump houses, garages and other installations where excessive moisture and dirt may prevail.



Two Speed Capacitor Start Induction Run Motors

Resilient mounted motors furnished in ratings of one-sixth to one-half horsepower. High speed 1750 r. p. m.; low speed 1150 or 850 r. p. m.

Speed changes are obtained by a simple three point switch or automatic control, providing speed control for belted blowers, fans and similar installations. Wound for long hour service, these motors have low starting current and normal starting torque.

Write for complete information and data sheets.

THE PEERLESS ELECTRIC CO.
WARREN, OHIO

QUICK CONNECTIONS *— Closeup view showing multi-pole plugs and cable with which control connections are made for conducting tests and for checking various calibrations.*

the plugs and multi-conductor cable are shown, with which temporary connections are made to the control wires of the adjacent cubicle. With this equipment set-up it is possible to install a circuit breaker, check its various calibrations and trip it under various conditions for which it is designed to operate.

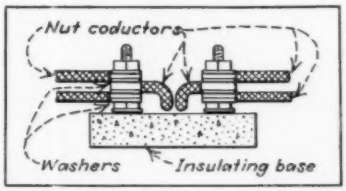
This equipment was installed by Hatzel & Buehler, Inc., electrical contractors who wired the Nemours Building.

How to Get Rid of Loose-Connection Troubles

Troubles in low-tension systems, originate most often from loose connections. So not only is it necessary to use connecting strips at junctions of cables and wires, but care must be taken to properly connect the wires to the terminal posts.

Often it is necessary to place more than one wire between the fastening nuts. When this occurs, metal washers should be used to separate the bare conductors, and in that way good contact surface is secured and a tight connection between the wires.

The drawing shows a typical example of the method which should be followed.



GOOD CONNECTIONS*—Wires connected to connecting strip.*

Prest-O-Lite Trade-Mark TORCHES AND SOLDERING IRONS... *ideal for electrical work*

● ***Prest-O-Lite*** **Torches and Soldering Irons are available in convenient and moderately priced outfits, covering every open-flame or enclosed-flame requirement of the electrical contractor. These appliances are economical equipment for soldering, heating and brazing.**

Prest-O-Lite **appliances operate on** ***Prest-O-Lite*** **Gas, which can be obtained conveniently in small tanks at any of the thousands of** ***Prest-O-Lite*** **Gas Exchange Service Stations. You exchange your empty tank for a full one and pay for the gas only.**

Your jobber will gladly demonstrate the many features of ***Prest-O-Lite*** **equipment. Call him, or write the Linde office near you.**

THE LINDE AIR PRODUCTS COMPANY
Unit of Union Carbide and Carbon Corporation
UCC
New York and Principal Cities
In Canada:
Dominion Oxygen Company, Limited, Toronto

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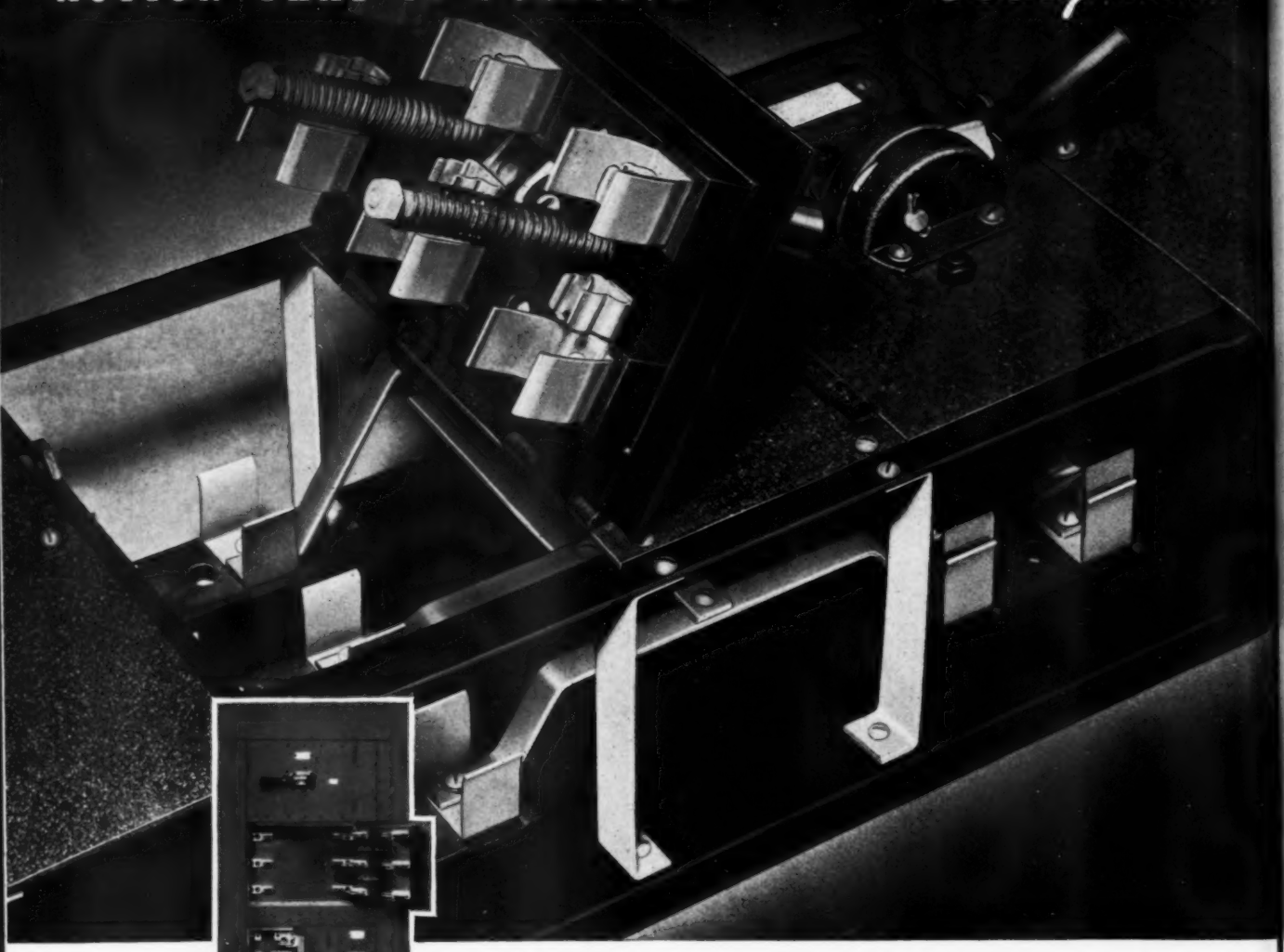
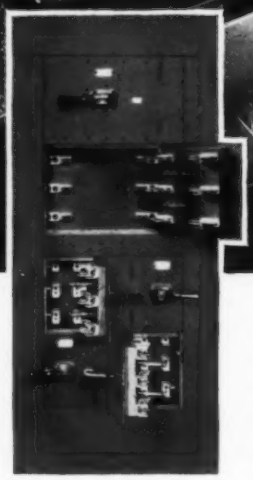
WHEN THIS TRIPLE "S" SWITCH OPENS YOU HAVE

Quick Break Double Break

ACTION THAT IS POSITIVE » » » *Every time*





● This TRIPLE S power panel unit has a switch that for many years has demonstrated its efficiency and safety under all sorts of service conditions. It can always be opened safely under load because the powerful pair of compression springs instantly breaks the circuit when the operating handle moves toward the *off* position. With handle in the *off* position, door opened, fuses can be easily inspected or tested individually, entirely free from feed-backs. In *off* position, contacts are close to door and label on door indicates condition behind the door. When door is closed, by throwing switch handle horizontally to opposite side the movable contact engages in the fixed contact and circuit is closed. Fool-proof, ruggedly built, *and safe.* The TRIPLE S name-plate on a power panel unit means uninterrupted current supply from that point on. Nearly 40 years of experience is behind every TRIPLE S panel built, and every one is designed by our own engineers. Ask for specification manual.

Manufacturers of Safety Power and Lighting Panels, Knife Switches, Pull Boxes, Cutout Boxes, Cabinets and Switchboards

THE CLEVELAND

Switchboard

» » COMPANY « «

2927 EAST 79TH STREET • CLEVELAND, OHIO

Established in 1900—Member N. E. M. A.

Branch Offices at Chicago, Detroit, Indianapolis, Buffalo, Dayton, Pittsburgh, Philadelphia, Baltimore, Birmingham

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Instruments As Sales Tools

[FROM PAGE 18]

$1,000 as being above the average investment.

Are more instruments needed? Present contractor inventories of portable instruments are being added to with later types or other kinds not on hand before. For instance, among 226 companies, these additions are contemplated: 54 ammeters, 35 voltmeters, 58 wattmeters, 50 graphic meters, 37 tachometers, 49 power factor meters, 46 megohmmeters, and so on.

What types of instruments are preferred? Portable instruments are preferred in the full-sized types by 80 per cent of this group of 226 firms, while only 19½ per cent favored pocket-type instruments. This indicates a recognition of the need for accurate readings under severe year-round service.

THESE PORTABLE INSTRUMENTS ARE OWNED BY 226 CONTRACTORS

Ammeters	554
Voltmeters	484
Wattmeters	196
Graphic Meters	114
Tachometers	154
Power Factor Meters	39
Megohmmeters	105
Other Instruments	155
Total	1,801
Average per firm	8

For general testing purposes, are separate instruments preferred or combinations of several instruments in one assembly? Of the 226 instrument users, 59 per cent prefer separate instruments, 40 per cent prefer to own certain combinations or assemblies of instruments. This leaves one per cent non-committed.

Here is what industrial contractors do with instruments in their daily work.

H. N. Crowder Jr. Co., Easton, Pa.: "Our complete instrument equipment is used constantly, the megohmometers being especially valuable. Since we also operate a motor repair shop, this equipment is used in both outside construction and shop work. We frequently make tests to demonstrate over-loaded lines, to demonstrate voltage drop losses, and to show grounds which are dangerous but not apparent."

S. J. O'Brien Sales Corp., New York City: "The following instruments are used in our various work. *Foot candle meter*—used to show a customer his present lighting intensity and when the re-lighting installation is completed, to show the increase in lighting. *Clamp-on ammeters*—This instrument has paid well for itself. This quick-acting instrument permits determining the load instantaneously, without having to disconnect feeders to take a reading. *Recording wattmeter*—Very useful for checking various wattages used over 24-hour periods, and for determining demand factors. *Direct reading tachometer*—For checking shaft and motor speeds without the use of a clock. *Voltage Tester*—To quickly determine unknown voltages up to 450 and to identify the various types of current we encounter. *Phase rotation instrument*—To obtain the proper phase relation in connecting a.c. generators. *Ohmmeter*—Reads from zero to 8,000 ohms and can be used as a bridge, and in conjunction with known resistances to determine the value of unknown resistances. *Stethoscope*—This instrument helps us in locating and eliminating vibrations, loose bearings, knocks in motors and different machinery."

J. M. Clayton Co., Atlanta.—"No industrial contractor can get along without a good assortment of all types of testing apparatus. Instruments are convincing and lead up to the installation of larger feeders and submains. Megohmmeter tests on conductor insulation show the advisability of installing new cables, thus avoiding serious feeder failures.

Birmingham Electric & Mfg. Co., Birmingham.—"It would be almost impossible to operate without instruments. A recent check-up was made at a cotton mill which had burned up several 50-hp. motors. A 75 hp. motor was found to have been put in to replace the 50 hp. drive, and our test with a clamp-on ammeter revealed that the motor was being operated single phase. Here an oversize motor was installed as a remedy, because no one discovered an open lead at the starting compensator. While this inefficient use of the 75 hp. motor caused no trouble, the previous 50-hp. motor burnouts were thus easily accounted for."

Wm. C. Krauth Electric Co., Louisville.—"Nothing is more convincing than a recording meter chart, when the real source or cause of trouble must be proven. Our recording voltmeter is the most valuable instrument we have. It has saved the cost of our entire lot of instruments during the past 3 years."

Armature Winding Co., Charlotte.—"We use our instruments constantly in our motor repair and manufacturing business."

Miller Electric Co., Jacksonville.—"Our instruments are part of our everyday work. We don't see how contractors can be such guessers as to work without any instruments."

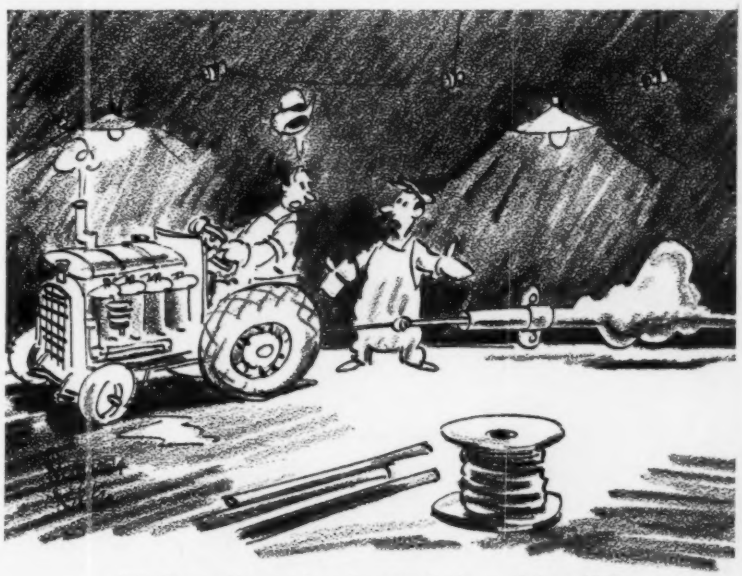
I. Gaynor, Inc., New York City.—"Our instruments are used mainly for the testing work in: lighting intensities, overloads on motors and lighting feeders, grounded conductors, bell and telephone systems, branch circuit voltages."

Walker Electrical Co., Atlanta.—"Our investment in instruments includes the latest curve drawing types as well as portable direct-reading wattmeters, ammeters, voltmeters, etc. I don't see how a contractor could well handle large industrial projects intelligently without using a great many instruments.

"We recently showed a large customer how to cut his demand by rearranging his operating schedules. Our report sold him on installing automatic equipment to cut off non-essential equipment when the demand reached a predetermined point. His demand charges were reduced by a large amount.

"A power factor correction scheme was then proposed which resulted in a $25,000 investment. This further reduced his demand, relieved overloaded feeders and improved voltage regulation at the end of his feeders. This corrective installation will make this customer a $25,000 net profit over a period of ten years."

These statements will bear consideration. Industry recognizes science today, searches for facts, and is willing to study convincing evidence. Plants are instrument-minded because they themselves are buying more of them than ever before, to test all kinds of routine processes. Modern contractors must supply similar methods, if they are to handle the big job ahead in the modernization of industrial electrical systems.



"It's Casey—He must have forgot to let loose of the cable!"

Better Lighting

PIT, LIFT AND WASH RACK LIGHTING

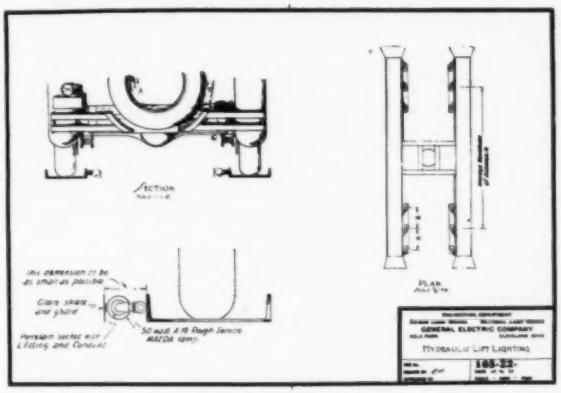
A good system for pits and lifts involves enough units to insure freedom from shadows at all times during the work. Moreover, they must be of small dimensions or so placed that they do not interfere with the movements of the mechanics. The photograph shows equipment on the lift itself. Note the glare shield and guard in the sketch. Movable or portable units placed on the lifts or the floor below take part of the attendant's time to adjust them for each operation, thereby increasing the length of time required for doing a job. In addition, too many shadows hinder the work.

Sometimes reflectors are attached to side walls of the building or panels are built in at intervals. They produce good results if floors are light in color and kept clean. But considerably higher wattage is needed than when the lamps are incorporated in the lift itself. They should be supplemented by equipment recessed in the floor.

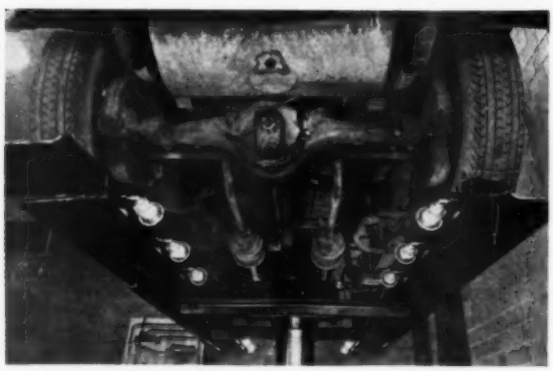
Floor units also have the disadvantage of being so far away from the raised car that excessive shadows result and the operator has difficulty to keep from standing in his own light. Furthermore, it is hard to avoid looking down into the lights at times. They should never be used without generous side lighting.

A satisfactory and generally accepted system for pits consists of reflectors or prismatic lenses recessed in the side walls of the pit and directing the maximum intensity at an angle of about 30 degrees upward. Units on 6- to 8-foot spacing on each side of the pit with 100- to 200-watt lamps are recommended.

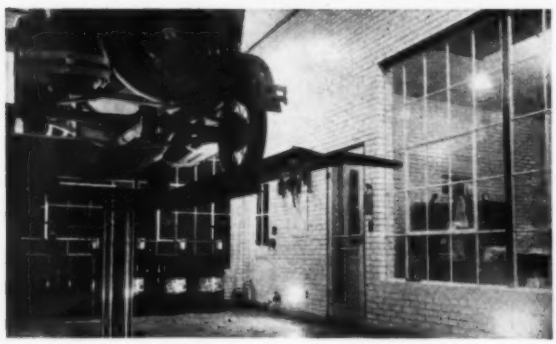
Wash racks are best lighted from angle reflectors placed 7 feet above the floor and on either side of the rack. Eight units, four on each side on 6- to 8-foot centers, are desirable. A more complete installation recommended where chassis cleaning is done, includes additional units along the floor on either side of the runway. Here all the reflectors should have protecting glass cover plates to avail lamp breakage due to water splashing on the lamps.



INSTALLATION DETAILS—How to arrange lamps along the lift.



LIFT LIGHTING—Convenient and efficient arrangement for lighting under the car.



FLOODS FOR LIFT—Lighting for units recessed in the walls and focussed on the car bottom.

WATTS PER SQUARE FOOT

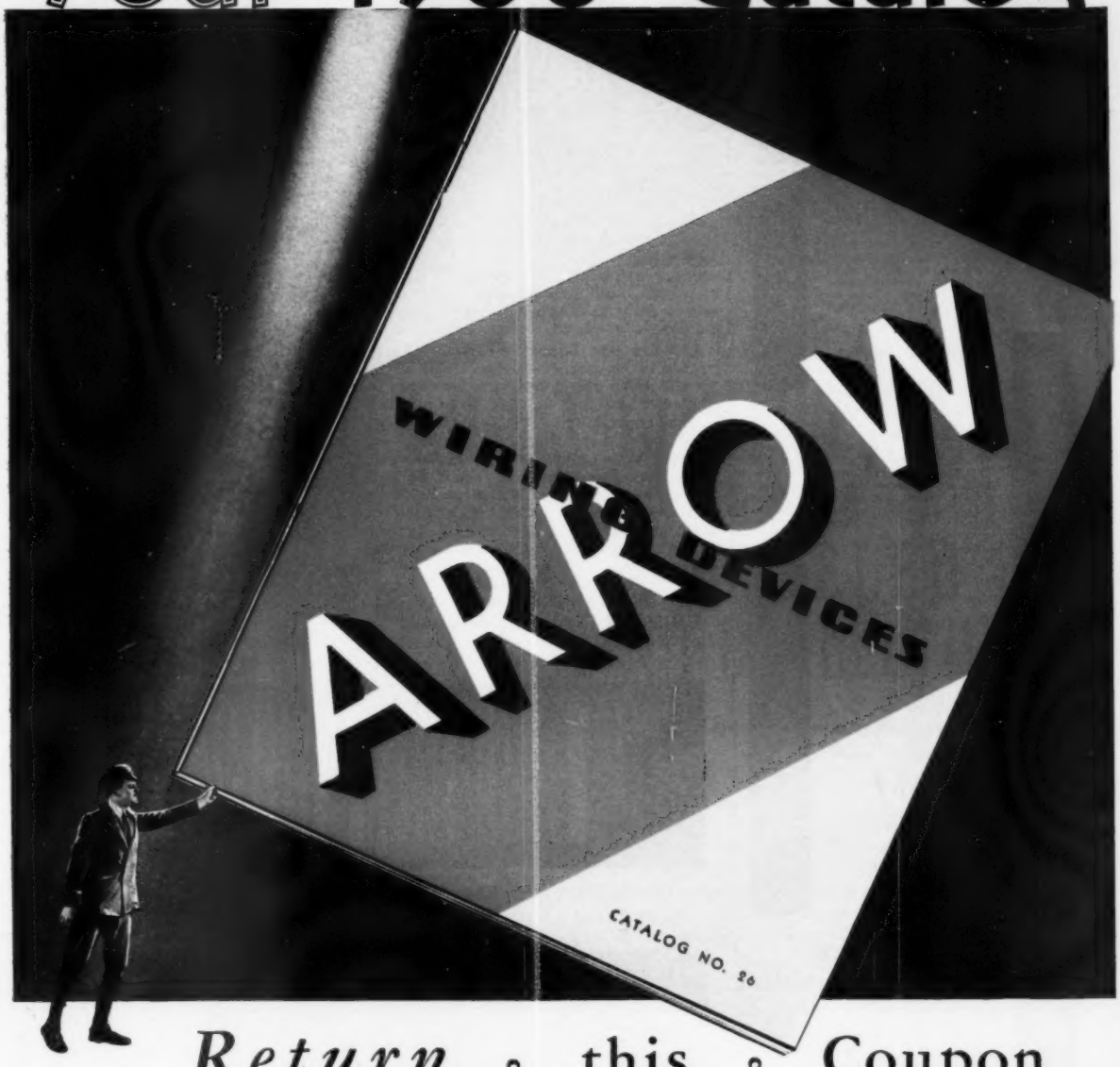
In many installations transformers, feeders, panelboards and other electrical requirements must be estimated before the final lighting plans and resultant loads are determined. The best means for preliminary estimating of the load is perhaps the common "Watts per square foot" basis.

Such a basis is not exact, however, because the footcandle result varies considerably, depending on the size of the room, color of ceiling and walls and type of lighting units employed. Actually, one watt per square foot may produce anywhere from 3 to 10 footcandles. For that reason, any "watts per square foot" load estimate should be based, not alone on the footcandles to be provided, but knowledge of the above considerations which have their definite bearing on the attainment of a desired level.

The allowances to be made per square foot for various classes of service are as follows:

1 Watt per Square Foot—For corridors, locker rooms, dead storage areas and inactive spaces, where the illumination requirements are of the order of

Your 1938 Catalog



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MANUFACTURERS FOR MORE THAN A QUARTER OF A CENTURY

Better Lighting

[FROM PAGE 54]

5 footcandles. Also, in factories, commercial buildings, and public interiors, where it is desirable to convert storage spaces into active work areas to meet immediate needs, the contractor should wire for at least 2 watts per square foot.

2 Watts per Square Foot—Will provide for illumination levels of 10 to 15 footcandles in industrial areas, 8 to 12 in commercial areas with standard reflecting equipment. This order of illumination is recommended for rough manufacturing work, packing, crating, storage and such areas occupied by mechanical and processing equipment, where only casual and intermittent attention is required.

4 Watt per Square Foot—Minimum provision to attain average levels of 20 footcandles; recommended for schools, offices, stores and for the large proportion of general industrial areas. In large areas, with direct lighting industrial reflectors, with a combination of favorable conditions, this allowance would be sufficient for as high as 30 footcandles. In small offices or stores, with indirect lighting, this allowance would permit only 15 footcandles. This represents the lower limits of modern practice, and is not sufficient for any future increase in the level of illumination.

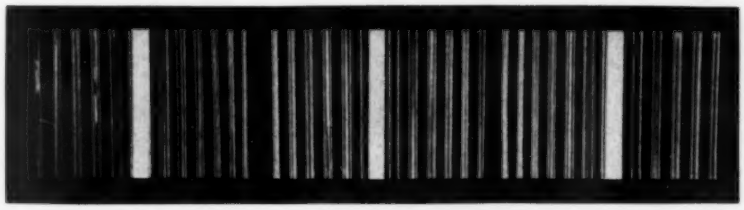
6 Watts per Square Foot—Should be allowed as a minimum in all areas where general illumination of 30 footcandles is recommended, but particularly in general offices, stores, and other commercial interiors. In small offices and similar small interiors, such as sight-saving classrooms where indirect lighting would logically be used, even higher allowances should be made.

8 Watts per Square Foot—Rooms less than 20x20, typical of the small private office, lighted by modern indirect systems, require installed wattage of this order to attain the 30 to 35 footcandles, that are being provided today. This order of wattage is also necessary for the many forms of louvered units, troughs and luminous architectural panel treatments, where illumination of the order of 20 to 30 footcandles is desired.

CORRUGATED METAL WITH LUMILINE

Another method of using corrugated metal is to form curved sections with Lumiline lamps placed at the focal points. The crest of each corrugation then picks up a reflection of the lamp, producing a series of long stripes.

The alteration of colors in cavities also gives attractive contrasts. These effects are produced very economically, as the 30-watt 18-inch Lumiline lamp will light an area 18 by 18 inches.



REFLECTION TRICKS—An interesting combination of Lumiline lamps and parallel background corrugations.

TESTIMONY—The Hickey-Freeman Company, of Rochester, says—"Well-made clothes demand an unusually high proportion of hand cutting, sewing and pressing. The seeing task is made difficult by the fact that contrasts are low, since thread and material must match in color. Hence the importance of good lighting has long been realized, and we have had a constant program of improvement in force for several years."—L. S. Bartlett, Production Mgr. They use R.L.M. reflectors, variously spaced with lamp size from 60 watts to several hundred.

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THE CERTIFICATE OF RLM UNIFORM QUALITY

Questions ON THE Code

Answered by
F. N. M. SQUIRES
Chief Inspector New York Board of Fire Underwriters

Why the "1937" Code?

Q. *"I was very much interested when John M. Turnbull came out in his first article on "Know Your Code" in the September issue of Electrical Contracting. I was very much pleased with the new lay-out and the way or new arrangement of subjects.*

Late last month I stopped in the City Hall at ——— to get the new 1937 code book. I was told that they were just taking it up with the printer. Is Mr. John M. Turnbull way ahead of himself, or is the Electrical Bureau at ——— slow.

It is just such things as this that makes men lose interest. And why call it the 1937 Code when we are almost into 1938?"—F. H. H.

A. The last question is one which continually comes up and with an explanation of its answer it will be realized that neither is Mr. Turnbull away ahead of himself nor is the Electrical Bureau at ——— slow.

At first thought it does seem strange that the 1937 Code would be made effective Nov. 1st 1937 and thus have but two months of life left in 1937 and then 12 months in 1938 and 10 months in 1939. So the question always arises, "Why not make it effective on January 1, 1938 and call it the 1938 Code?" This would also give everybody an extra two months in which to study the new Code and in which to prepare for its enforcement and compliance. While we have been mentioning the 1937 Code the same goes for each issue with but a change in the number of the year. But let us look into the history of the 1937 Code for the answer.

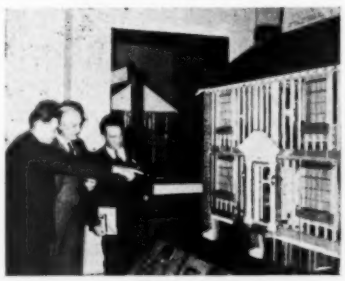
The 1935 Code was in effect. During 1935 and 1936 the various Article Committees of the Electrical Committee of the NFPA were studying the rules and preparing suggestions for revision to the Code. On January 1st 1937 the suggestions were published. The Electrical Committee met in March 1937 and approved revisions to the Code and the revisions were then submitted to a meeting of the NFPA in May 1937 which meeting, approved the revisions thus changing the 1935 Code into the New Code. The new Code was then submitted to the American Standards Association and received its approval as an American standard still in 1937 and was then put on the press and published and as all of this happened during the year 1937 it can very properly be called the 1937 National Electrical Code.

Now for the first part of our correspondent's inquiry:—

Immediately after the Electrical Committee meeting in March a printer's galley proof of the entire text was prepared. This galley proof was fairly accurate and free from errors and omissions but a corrected galley proof was later struck off. These proofs were available to the members of the Electrical Committee and other interested parties, and one of these was evidently used by Mr. Turnbull in order that his article could be ready for his readers by the time the new Codes were published and distributed.

This last could not be done until the approvals of both the N.F.P.A. and A.S.A. had been secured and then, of course, the mechanical work of printing, binding and distributing would take considerable time. While a special edition was run off in time for the various meetings of the International Association of Electrical Inspectors (starting the latter part of August) these were printed before the approval had been secured from the A.S.A. The distribution of the Codes began about Nov. 1st and probably the Electrical Bureau at ——— have them by now but didn't have them when the inquiry was made.

It must also be realized that all of Mr. Turnbull's article could not go in one issue of the magazine. As it had to be spread over several issues, it was necessary to give it a head start.



COMFORT HOUSE—Electrical inspectors at the Chicago convention of IAEI viewed with interest a model house constructed to illustrate adequate wiring provisions. Built by Detroit Edison at a cost of $3500, H. J. Morton points out some of its interesting features to Victor H. Tousley, IAEI secretary, and O. K. Coleman of New York.

Trouble With Lightning

Q. *"Will you kindly help me with this problem?*

There is a five-story steel frame apartment house with elevator motor located on the roof. Two No. 1 wires in 1½" conduit run from the 550-volt D.C. service to the 15 hp. motor. The conduit is grounded to the waterpipe before it enters the cabinet. Lightning has affected this elevator feed several times causing it to burn through the conduit."—J. Y.

A. It would probably be well to check up and see that the steel frame of the building is effectively grounded and also to make sure that the conduit to the elevators is well grounded. Then it might help to ground the conduit to the steel frame of the building both on the roof and in the basement. With all of this grounding well taken care of electrically, there should be no further trouble with lightning.

Circuit Arrangement

Q. *"The generator and batteries are located 50 feet away from the house in a small building. A 60 ampere main switch is used at the plant with No. 4 R.C. wire to panel board in house. I want a light in the power plant building. Do I have to use No. 4 wire from the 60 ampere switch to a separate 30 ampere fuse block, to provide a circuit protection to this one light? If so, could I use a smaller wire than a No. 4 for feeder to this fuse block? How small could I use? There are 20 ampere fuses in the fuse block to protect No.*

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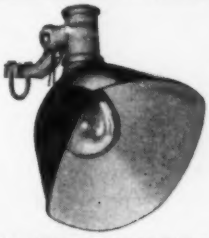
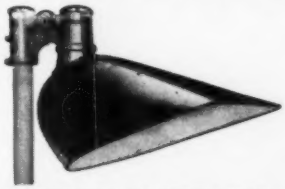


QUARTO FLOODLIGHT



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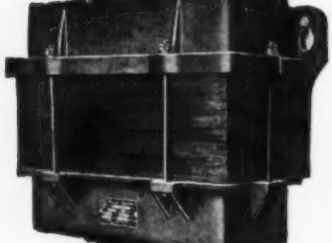

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* Units 15 Kva. and larger for indoor service only.

Type "CF" Applications

1. Stepping down power circuit voltage to 115/230 volts for lights, small motors or heating elements. In this way advantage may be taken of lower power rates for low-voltage loads.
2. Obtaining a 3-wire circuit from a 2-wire system.
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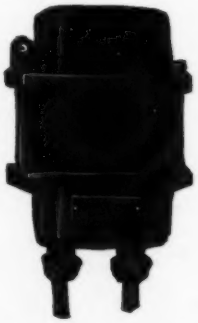

Type CF, single-phase, indoor type, air-cooled transformer.

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Questions on the Code

[FROM PAGE 58]

12 circuit wires as per N. E. Code rule."—A. C. B.

A. A 30 ampere fuse holder with a 15 ampere fuse should be provided for the circuit to the light in the power plant building. If this fuse holder can be located within 25 feet of the 60 ampere fuse protecting the feed to the house, No. 10 wire may be used between the 60 ampere fused switch and the 30 ampere fuse holder. Of course, the circuit wires to this light should be No. 12. The fuses to protect all of the No. 12 wire circuits should be of not over 15 ampere rating.

The use of the larger size circuit wiring is to take care of the increased current needed to deliver the power required at a lower voltage and also to prevent an excessive drop of voltage in the circuits. The usual voltage of these low voltage power plants is 32 and at this potential the drop in voltage is between 12 and 13 times the drop in a 110 volt system.

Farm Yard Controls

I would appreciate it if you would send me information which I have had difficulty in securing elsewhere.

As the trend of the more progressive farmers is turning to lead sheathed underground cable, between outlying buildings, I have had difficulty in securing proper means of installation of same. To make my request more clear I am drawing a three wire circuit between two buildings. This cable is used to feed electricity to a barn, and control a yard light on a wooden pole—L.H.M.

Q. *No. 1. I would like to know what means of tap-off can be used at point "B", where the middle wire or switch wire passes through the yard light. I would like to change to conduit slightly below ground level so as to give the wires mechanical protection. What kind of a fitting should I put at point "B" to tap off from the two cable ends and continue up the pole to the yard light in conduit? This fitting must be water-tight and not too expensive for the average farmer.*

A. No. 1. A circuit wired as shown in the first sketch would not be in compliance with the National Electrical Code as it would conflict with two provisions of the Code when the switches are in one of the positions.

Rule 1204-b requires that three-way and four-way switches shall be so wired that only one pole of the circuit will be carried to the switch. Rule 1204-a

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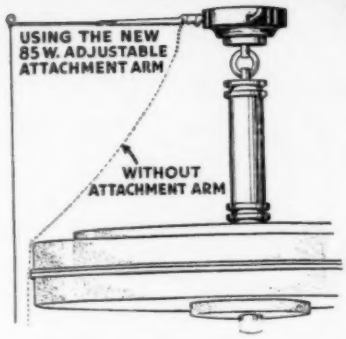

Made of metal 1/32-inch thick, and formed for additional strength and rigidity. Closed, 5¼ inches. Extends up to 9½ inches.

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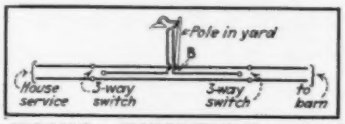
Cut-away view of No. 110 Box showing how the tapered unit receptacle fits tapered opening in top of box body. The last word in design, appearance, and simplicity of installation.

Questions on the Code

[FROM PAGE 60]

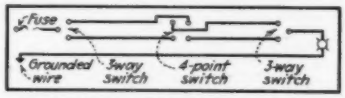
specifies that no switch shall be installed in the grounded wire.

Then the second sentence of Rule 2001-a requires that the identified (neutral) wire of a branch circuit shall be connected to each lamp on the circuit.



WRONG CONNECTIONS — Yard light hooked up in violation of Code.

The tap-off at the pole should preferably not be made underground but the cables to and from the pole should be run up to a weatherproof junction box on the pole above the ground level. If mechanical protection to the cable is deemed desirable where the cable is above ground, conduit or other protection can be slipped over the cable.

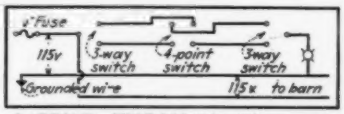


STANDARD CONTROL—Three control locations for one or more switch outlets.

The connections of the cable into the box can be made water tight by means of connectors available for the purpose and now on the market.

Q. *No. 2. How can I control this yard light from three points: the barn, the house and garage? Will I need four wires, or can the light be controlled with a three wire cable, and also feed the lighting of the barn? I understand the control of one light by a four-point and two 3-way switches in a circuit where a continuance of feeding electricity is not desired, to be like my second sketch. I would appreciate it if in answering my request you will show a diagram and state number of wires required.*

A. No. 2. In order to feed current beyond the light controlled by the 3-way switches it is necessary to carry but one extra wire to this point as shown in the third diagram. Of course the extra wire must be within the same armor as the other wires.



CARRIED THROUGH—Three-switch control with "hot" wire extended to barn.

"WOULD SAVINGS LIKE THESE *for Your Customers* GET MORE BUSINESS FOR YOU?"

WESTINGHOUSE
ELECTRIC & MANUFACTURING COMPANY
EAST PITTSBURGH, PA.

$15 NOFUZE CIRCUIT BREAKER SAVES $60 WEEKLY

NOFUZE BREAKER INSTALLATION REPAYS ITS COST IN 8 WEEKS

$360 NOFUZE BREAKER SAVES $2000 YEARLY

ACTUAL, SPECIFIC CASES - referred to right while you're selling the idea of a new wiring job - that's where proved examples of Nofuze Circuit Breaker savings are mighty effective selling tools.

Contractors tell us they've used them with success on the "toughest" prospects. They get the attention of the men who really do the buying. They stir up interest in how your services can REDUCE COSTS and INCREASE SAFETY. They're a real lever to swing new wiring jobs and even maintenance contracts.

Why? Because nothing is so specific - interesting - so convincing as a real example of what a piece of equipment has actually done in service.

The savings referred to above were made in ordinary plants, with ordinary circuit protection problems. Fuse outages were causing costly losses in time by men and machines. Nofuze Breakers eliminated these losses.

Probably you know of several plants in your territory where savings like these could be made and safety standards could be raised. Check over your lists. Then call our wholesaler for facts and record stories you'll need to get the order - not just for Nofuze Breaker sales, but for new wiring business.

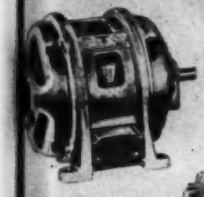
We're ready to help you make the most of Nofuze sales opportunities.

Sincerely yours,

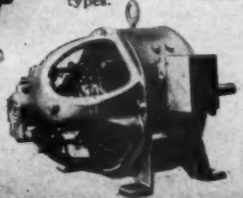
Westinghouse Electric & Mfg. Co.

NOFUZE "DE-ION" CIRCUIT BREAKERS *100% Safety* PLUS *Important Savings*

Every House needs Westinghouse



CS (AC) MOTORS for any constant-speed drive—all sizes and types.



(DC) MOTORS. ...tory's most popu... general purpose motor.

"DE-ION" LINE-STARTERS—Most important forward step in entire history of motor control.

SAFETY SWITCHES—Every size and type, with exclusive Westinghouse Diamond-pointed jaw construction.

FROM INCOMING LINE TO DRIVEN MACHINE *Install* Westinghouse

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Questions ON Signalling

Answered by
ALBERT A. SCHUHLER

Bedside Phones On Nurses Call

Q. *As the contractor doing work for a local hospital, we have been asked to check into the possibilities of adding service-phones to a nurses call system. Consideration is to be given only to private rooms. No spare wires are available. The call system is of the low-tension type.*

Is it possible to use some of the present wiring for the service-phone system? If not, how much extra wiring will be necessary for this extra feature?—S.E. Co.

A. It will be necessary to install all wires for the service-phone system. If of the non-tube amplified type, one of the common feeder wires may be used as a common wire, but this depends upon the system selected. Some systems require two wires from each bedside directly to the master unit at the nurses station. Other systems require one common wire and two section wires for each room station.

For Interphones In Noisy Places

Q. *One station on an interphone system, in a factory, is located in a noisy location. Most of the time it is very difficult to hear well. Can anything be done to improve this condition? We have checked our battery and find that it is in good condition. —T.L.*

A. One method of overcoming this trouble is to connect a standard push button in multiple with the telephone transmitter. In this way the high resistance of the transmitter is shunted out of the receiver circuit, when the push button is pressed. When speaking from this telephone, it is necessary to leave the push button in the normal or open-circuit position.

The use of a rubber ear cushion may be used on the receiver in addition to the push button, as an additional aid in overcoming this problem.

Message Signals On In-and-Out System

Q. *We wish to add message signals to a present In-and-Out recording system in a hospital. At present we have an entrance register with a switch and an illuminated name compartment for each member of the staff. In addition, an office indicator is located by the switchboard operator, with an illuminated name compartment for each staff member.*

We want the switchboard operator to control message signals. The system operates on 24 volts AC. Corresponding lamps in the register and the indicator are connected in series.—C.S.

A. The simplest way to add the message signal feature without additional wiring, is to mount a three-way switch for each member of the staff, next to the individual name compartment on the office indicator. Or if there is insufficient space, provide a small plate in the form of a strip adjoining this unit.

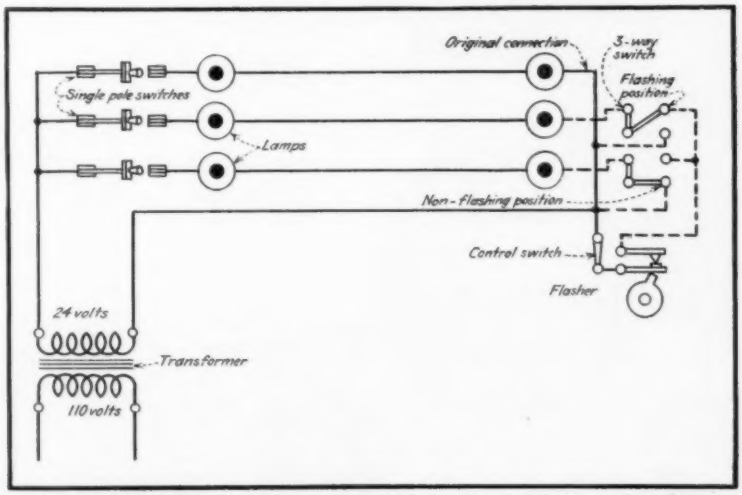
It will be necessary to reconnect the wires to the lamps in the office indicator as shown by means of dotted lines in the accompanying drawing. Also provide a small single circuit flasher with a control switch.

Normally the three-way switches are left in the non-flashing position and when a member of the staff operates his switch, both lamps operate steadily. However, should there be a message, the operator throws the three-way switch to the flashing position and operates the control switch. Both lights flash as soon as the corresponding switch is operated in the entrance register. Should the message signal be placed in operation after the member of the staff has entered the building, he will notice his flashing signal when passing the entrance register, or when he is ready to leave the building and "checks out."

Protection Applied to Rugs

Q. *In a particular neighborhood, where apartments have furnished lobbies, a number of thefts have occurred. Rugs and chairs have been stolen. Are fittings available which may be attached to these furnishings to prevent thefts?—J.C.*

A. While no special fittings are available for such purposes, many of the standard devices may be used with slight modifications. For example, the wiring may be extended from the plug of a floor push to a rug or chair, using very fine stranded wire for making connection to the furnishings. Then with a closed-circuit system any attempt



FOR MESSAGES—*Here is a way to add message signals to an In-and-Out system without installing additional wiring.*

Make Your *Mercury Lamps* Pay FULL Dividends

At Right: Weather-proof pole mounting type transformer.

Above: Indoor wall mounting or fixture suspension type transformer.

At Left: Weather-proof wall mounting type transformer.

Select Your Transformers from the JEFFERSON Line!

● Much depends on the dependability of the transformers used with mercury lamps. They must be "technically correct"—designed with full allowance for continuous service and the exacting requirements. They must insure long life of lamp—and uniformly maintain the voltage level for steady illumination.

Jefferson Electric engineers have had long experience in the special field of transformers used for all types of lighting purposes—luminous tube (Neon) lighting, street lights, sun lamps, and the like.

Jefferson Transformers will give you full dividends on your mercury lamp systems. JEFFERSON ELECTRIC COMPANY, Bellwood (Suburb of Chicago), Illinois. Canadian Factory: 535 College St., Toronto, Ont.

Write for New Catalog 371-ML.

JEFFERSON
MERCURY LAMP
TRANSFORMERS

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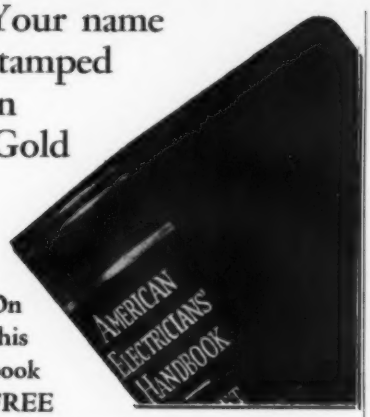
Your name stamped in Gold



On this book FREE

At no additional cost to you, we will stamp your name, or a friend's name, in gold on the front cover of any copy of Croft's American Electricians' Handbook ordered from this advertisement. This is a special Christmas offer limited to acceptance before January 1, 1938.

Terrell Croft's

American Electricians' Handbook

1018 pages of direct helps showing you how to handle every type of practical electrical job, $4.00

CROFT'S American Electricians' Handbook has become world-famous. Nearly a hundred thousand practical electrical workers know and respect this great pocketbook of practical electricity. It presents the kind of information that helps practical electrical men — wiremen, contractors, linemen, plant superintendents, operators and construction engineers—to select and install commercial electrical apparatus and materials intelligently for the performance of specific services. It gives the kind of data that will help them to operate electrical equipment efficiently and to maintain it at high operating efficiency.

Do you want to make a friend a gift combining personal thoughtfulness with real utility? Do you want a copy of this big Handbook that you will doubly prize? Then take advantage of this free stamping offer. Send the coupon today. (Proper remittance should be enclosed with order and, of course, stamped copies are not returnable.)

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☐ With name stamped in gold. I enclose $4.00, and understand that stamped books are not returnable. (Offer expires Jan. 1, 1938.)

☐ For ten days' examination; without gold stamping. I will send $4.00 plus few cents postage in 10 days or return book postpaid. (Postage paid if cash accompanies order.)

Print name to be stamped, here

Name .....

Address .....

City and State .....

Position .....

Company .....E.C. 12-37

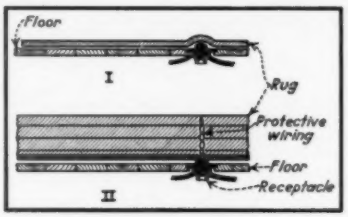
(Books sent on approval in U. S. and Canada only)

Questions and Signalling

[FROM PAGE 64]

to cut the wires or remove the rug will sound an alarm.

The accompanying illustration shows the normal appearance. The rug is shown resting on the floor at I. The rug is shown raised at II. Note here



BURGLAR ALARM—Method for protecting a rug or chair against theft.

how small twisted flexible wire, with twisted bare ends, may be attached to the rug. Should the rug be removed, or should the wires break, the alarm is transmitted to the superintendent's apartment or other location.

Magneto Telephones For Long Lines

Q. *It is our intention to install a pair of telephones to operate from one point to another, over a distance of about one mile. Can the regular pair phones or private line telephones be used for this service? What is your suggestion for a system to operate over this distance satisfactorily?—H.C.*

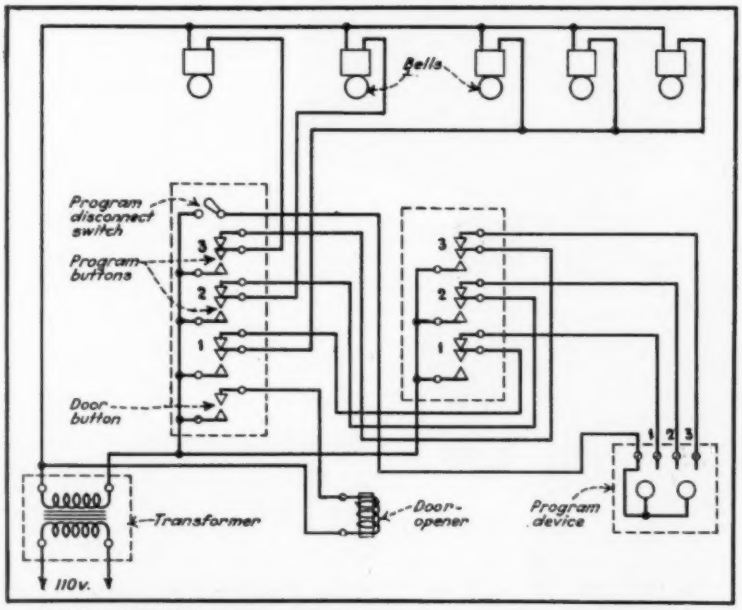
A. Some high grade pair phone systems operate satisfactorily over this distance. But it is necessary to use about a No. 12 B & S gauge wire, and increase the number of dry cells. In addition, the bells should be higher resistance wound.

Magneto telephones are especially suitable on these long runs. They are economical and generally found to be more satisfactory in cases of this kind.

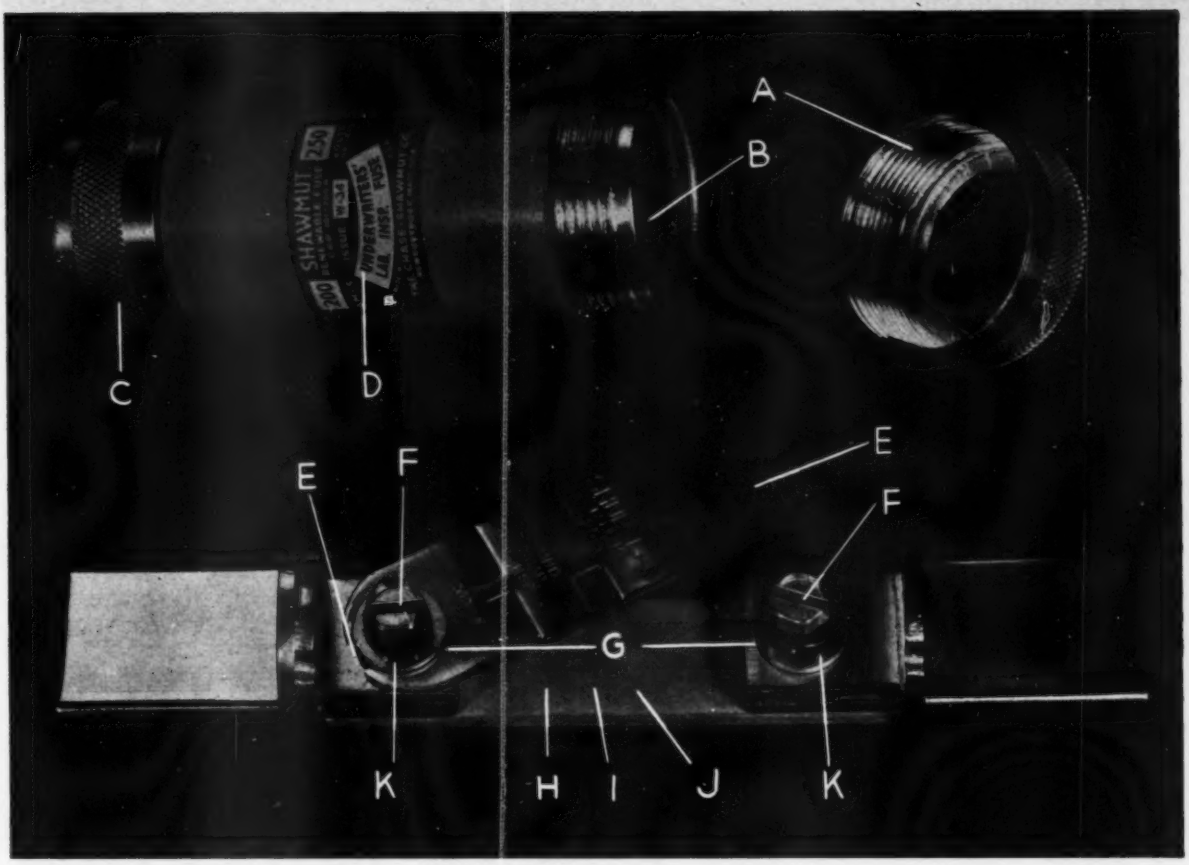
Program System for Store

Q. *We wish to install a program system which will enable bells to be operated automatically throughout a store. It should be arranged for one schedule from Monday to Friday, and another schedule on Saturday. In addition, we want to operate the program bells manually from the office, and also from the information desk. Some means of disconnecting the program device is to be provided in the office. A door-opener is to be controlled from the office control board.—W.H.B.*

A. A complete drawing showing the wiring and equipment required is shown here, and is self-explanatory. Note that the push buttons at the control board are of the return-call type, in which one contact spring is normally on closed-circuit, while the other contact spring is on open-circuit. The program device must be of the two-circuit type, since the bells must operate on two different schedules.



STORE SIGNALS—Wiring layout for a program system providing for two schedules of operation with several control points.



AS SIMPLE AS A · B · C

A — UNIT REMOVED FROM CASE BY UNSCREWING ONLY ONE END CAP
B — MAXIMUM THICKNESS OF FIBRE AT THREADS — ADDED STRENGTH
C — END NOT FIXED — CAN BE TAKEN OFF TO CLEAN CASE
D — LISTED AS STANDARD BY UNDERWRITERS' LABORATORIES
E — LINKS HAVE OPEN END SLOTS — EASY TO INSERT
F — LINK READILY REPLACED BY LOOSENING CLAMPING SCREWS
G — PERMANENT RIGID BLADE ALIGNMENT
H — BLADES ASSEMBLED TO EXTRA HEAVY INSULATING CROSSBAR
I — CROSSBAR REPLACEABLE
J — CROSSBAR OF MAXIMUM THICKNESS — LONGER SERVICE
K — LARGE CLAMPING AREAS — BETTER CONTACT

Least number of parts, sturdiest construction, easiest and speediest renewal. Can be assembled only one way — the RIGHT way. The utmost in economy, service, and protection — and the cost is no higher.

SHAWMUT S SHUR-LAG

RENEWABLE FUSES

Approved by Underwriters' Laboratories

The **CHASE-SHAWMUT COMPANY · NEWBURYPORT · MASSACHUSETTS**

Fuse makers since 1893

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PERFORMITE

The Modern RUBBER INSULATION

BY ALL known accelerated aging tests Performite rubber insulation is far ahead of any other commercial insulation. It is non-corrosive, free-stripping, long-lasting. Performite shows surprisingly little deterioration in the oxygen bomb, air bomb and air oven accelerated age tests.

One of its outstanding characteristics is its resistance to deterioration by heat. It is recommended for operation at conductor temperatures up to 75 degrees Centigrade, thus providing a tangible advantage over most other types of rubber insulation in economy of copper size. Its stubborn resistance to heat makes it better suited than ordinary rubber insulations for hot locations.

Performite should be used for monumental building jobs; for airport, park and street lighting; for power circuits and other vital circuits where failure would be expensive and where safety, economy and long life are essential.

Performite meets the requirements of Federal Specifications JC-106, JC-121, Department of Commerce Airport Specifications and others requiring heat-resisting or super-aging rubber insulation.

UNIFORMITY — SAFETY — PERFORMITE WIRES & CABLES — LONG LIFE — DEPENDABILITY

HAZARD INSULATED WIRE WORKS

Division of the Okonite Company Works: Wilkes-Barre, Pa.

Sales — New York, Chicago, Philadelphia, Atlanta, Seattle, Dallas, Washington

Offices: — Pittsburg, Buffalo, Boston, Detroit, San Francisco, St. Louis, Los Angeles

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In the News

CERTIFICATES FOR TVA FARMS

Electro-Development Farm Certificates are being awarded to farm families that have installed adequate electrical equipment, under a plan sponsored by the agricultural extension services of the University of Tennessee, Alabama Polytechnic Institute, Mississippi State College, University of Georgia, and the Tennessee Valley Authority.

The selection of Electro-Development farms is based on the merits of the equipment a farmer has installed, as applied to the type of farm. Wiring, lighting, and house requirements for an Electro-Development farm are:—

Wiring and Lighting

1. Three-wire, 60-ampere service or larger
2. Wall switches
3. Convenience outlets in kitchen, living room, dining room and bedroom
4. Principal lights shaded.

Appliances and Uses

1. Running water at sink
2. Electric range or refrigerator
3. Radio
4. Electric Iron
5. One of the following: Electric water system, washing machine, water heater
6. Three of the following: Running water in the bathroom, toaster, percolator, waffle iron, sewing machine, fan, kitchen mixer, hotplate, dishwasher, churn, vacuum cleaner, heating pad, electric fly trap, heater, grill, meat grinder, ironer.

In addition to these requirements a general Electro-Development farm must have:

1. Barn lighted
2. Barnyard lighted
3. Any three of the following: Feed grinder, sheep shears or animal clippers, tool grinder, ensilage cutter, hay hoist, grain elevator, wood saw, irrigation pump, poultry house lights, electric brooder, seed cleaner, electric hotbed, threshing machine, cider press, pump jack, milking machine, milk cooler, incubator, burglar alarm, electric fence, concrete mixer, corn sheller, cream separator.

Additional requirements have also been provided for dairy and poultry farms.

In the promotion of its Electro-Development farm plan the extension services will see that special meters are installed so farmers may know the costs of operating the different pieces of electrical equipment. Both owner-operated and tenant farms are eligible for certificates. The county extension service arranges for inspections by a rural electrification committee which determines whether farms conform to the required standards.

CHECKING UP NEW YORK FIRE JOBS

Contractors of New York City, who repair electrical systems or equipment damaged by fire are being asked to report any cases where there is evidence of fires caused by electric current. Immediate investigations of such reported cases are promised by the city's Bureau of Gas and Electricity, because the information to be gained is considered beneficial to all parties concerned.

D. HAYES MURPHY PRESIDENT OF NEMA

At the annual meeting of the National Electrical Manufacturers Association, the end of last month, they elected as president, D. Hayes Murphy, president of Wiremold Company of Hartford. Five vice presidents were also elected—F. W. Magin, Square D Company; Matthew Porosky, Gamewell Company; Walter Robbins, General Cable Corporation; C. E. Swartzbaugh, Swartzbaugh Manufacturing Company; and N. G. Symonds, Westinghouse Electric & Manufacturing Company. H. C. Petty, Crocker-Wheeler Electric Manufacturing Company, is treasurer.

D. HAYES MURPHY

Building Boom?

The biggest boom the electrical contracting business has ever seen will develop if the President's hopes materialize with respect to housing. There is some evidence that it may, despite the futility which has characterized most of the talk about housing since government officials began to talk of it.

The President still harps on the necessity of getting the cost per room down, but there are indications that he may surrender just a little to the profit motive in approving plans now being studied. The trouble has been that while there was plenty of cheap government money, government insurance, and governmental blessing generally, there was such a strenuous effort to hold down costs by restricting profits that private initiative could not see its way clear to a profit. Not just a profit on a transaction which turned out well, but a gross profit on ALL the jobs undertaken.

This allowance for the occasional loss has been something the President and his advisers never took into consideration, according to the experts.

But there are from 600,000 to 1,000,000 American families in urgent need of better housing, depending on whose statistics you use. And whatever may be the necessity for holding costs down, the President is determined that electrical equipment shall be provided in profusion.

CARTER FIELD
Washington Bureau,
McGraw-Hill Publications

YOUNGSTOWN POOLS RANGE WIRING

Seeking to provide higher efficiency in making electrical range and water heater installations at reasonable prices, a novel corporation known as the Steel City Installation Company, was recently formed in Youngstown, Ohio. Financed by a group of local electrical contractors, this company was organized to specialize in range and water heater wiring. It has been provided with new equipment. Such work had previously been awarded to individual contractors by the public service company.

Contractor-stockholders of the new company have withdrawn from range wiring so as to save these jobs in one centrally controlled operation. P. M. Geary, local association manager is also in charge of the new company, having established larger quarters that combine both offices, a meeting room for the association, and a contracting warehouse.

The company operates three new trucks, two of which were specially designed as mobile stock and tool rooms for range teams. The third truck is used for special

deliveries. Wiremen are selected who have specialized skill in replacing services and installing range wiring. A plumber is employed for making water heater connections, and works from one of the trucks.

Work is installed at flat prices that were calculated from reasonable average quantities of labor and materials required. Eight basic flat price operations were required to cover certain appliance combinations and existing service conditions. In addition there are unit prices for extra lengths of service or circuit runs. Certain miscellaneous extra work is billed at a stipulated percentage markup upon such additional costs.

SIX REA PROMOTION REGIONS SET UP

Since the appointment of George D. Munger as Director of Utilization for the Rural Electrification Administration, a promotional campaign has been set up to build load among rural customers on completed or well advanced lines in states east of the Rocky Mountains. This area has been divided into six regions, to each of which is being sent a crew of trained demonstration agents.

The size of crews will vary with the amount of REA activity in each region, but the minimum crew will consist of one electrical expert, one agricultural engineer, and one home economist. Each crew will confine its efforts to the designated region, and will be directed from the Washington headquarters. Normally the members will work separately, but they will combine forces when representing REA at large gatherings of farmers such as fairs and other meetings.

COMING MEETINGS

National Warm Air Heating and Air Conditioning Association—New York City, January 24-26, 1938

American Institute of Electrical Engineers—New York City, January 24-28

International Heating and Ventilating Exposition—New York City, January 24-28

National Electrical Manufacturers Association—Waldorf-Astoria, New York City, February 7-11

A. R. SMALL REPORTS TO NEMA

The history, operations and financial status of Underwriters' Laboratories, Inc. was presented before the recent NEMA Convention at Chicago by A. R. Small in an address "A Report to Clients." Tracing the Laboratories' work from its Report No. 1 of March 24, 1894 to date, Mr. Small revealed a payroll of $392,315 for 340 employees, for six months ending June 30, 1937. Of this employee group 191 are engineers. During this period 2,312 applications for tests of material and equipment were filed, of which 1,529 applications or 66 per cent were for electrical products.

Mr. Small reported that Label Service is now operated for 97 separate categories of appliances and materials. Of these 46 are electrical, and 38 are subject to requirements of the National Electrical Code. Annual Reexamination Service applies to 455 classifications of products, of which 185 are for electrical equipment. The products of 214 NEMA members are to be found in the current List of Inspected Electrical Appliances.

ANNOUNCE GADGET FOR SELLING TO HOMES

Recent meetings of the New Jersey Council of Electrical Leagues, representing eleven communities, devoted considerable discussion to ways and means of successfully approaching the home re-wiring market They propose as an entering wedge, the use of portable plug-in demonstration kits employing a circuit breaker unit and auxiliary red and green pilot lights. As a result the Market Development Committee of the Council has endorsed these kits as representing a useful sales tool for contractor members, who plan to promote comfort wiring and home wiring modernization. At subsequent meetings this method of selling was discussed in detail, the Essex Electrical League reporting 112 in attendance at a general meeting called for this purpose.

"Snap out of it, Gus—we gotta get this power line through."

WHO WILL HELP

The Library of Congress would like to acquire a complete file of "Electrical Contracting" for the National Library. So far we have not been able to locate copies of the November and December 1933 issues which are needed. If any of our readers can spare either or both of these missing issues they will be much appreciated by H. S. Parsons, Chief, Periodical Division, Library of Congress, Washington, D. C.

BUFFALO FALL LIGHTING CONTEST

For the third year a Fall Lighting Contest is under way at Buffalo sponsored by the Electrical League of the Niagara Frontier. Begun in 1935 with sales of lamps and equipment capacity totaling 700,000 watts, the 1936 contest totals reached close to 2,000,000 watts. Predictions are made by Samuel S. Vineberg, League manager, for a further increase during the current campaign.

Interest is runing high this year, as witnessed by a turnout of 150 salesmen for the opening afternoon conference, and with 314 present for the evening program. The contest is set up in divisions covering industrial, commercial, contractor-dealer, and home lighting. For power company employees only, there is a separate division for industrial, commercial and sign lighting. There are $25, $10 and $5 prizes for each division based on definite points of credit. A general prize is included for each two weeks highest score, and finally three cash prizes for the most outstanding lighting jobs entered during the period of the contest ending November 27th.

MORE ABOUT RECESSED FIXTURES

Electrical inspectors of the Pacific Coast and northwestern states generally regard lighting fixtures of the all-enclosed, recessed or flush types as possible hazard. Where high wattage lamps are used they often cause overheating due to insufficient ventilation or radiation characteristics. At the recent joint convention of the Northwestern and Southwestern sections of IAEI some of the problems arising from this

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FLOODLIGHT OF THE MONTH

General-Utility Floodlight

Type L-31
750/1000 Watts

No. 6 of a series to acquaint you with G-E floodlights to help you increase your profits

THIS FLOODLIGHT WILL BOOST YOUR PROFITS

For the lighting of large sports areas, buildings, railroad yards, parking fields, mining operations, and other permanent installations, your recommendations should include General Electric copper floodlights.

These sturdy, medium-priced units will meet the most exacting requirements. When you sell them, you profit also from the sale of the cable, time switches, lamps, and wiring supplies. The nearest General Electric sales office or branch of the General Electric Supply Corporation will gladly help you work out the specific requirements for any job.

STURDY CONSTRUCTION

This projector is built of copper and bronze throughout for long life. A silvered-glass reflector is used for highest possible efficiency. The projector is totally enclosed and weatherproof, equipped with three lever-type door clamps that provide easy access to the interior. Provision is made for mounting on pipe or flat surface, as required.

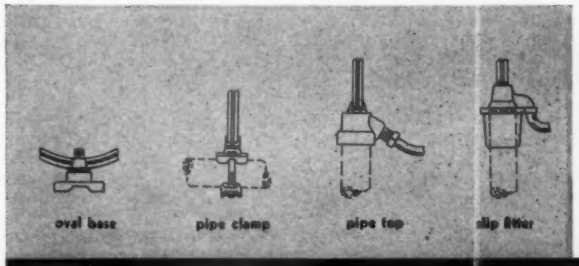
EFFICIENT PERFORMANCE

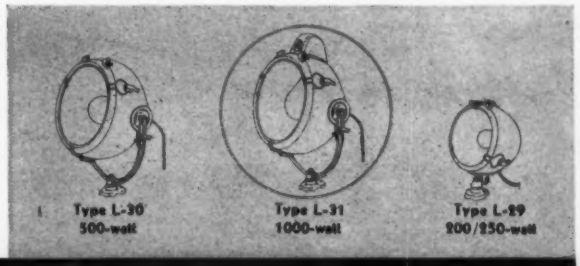
High efficiency reflectors; adjustable lamp-focusing mechanisms; and plain, stippled, and spreadlight door glasses provide for efficient light beams of several useful widths. The enclosed construction assures good maintenance of initial efficiency with the minimum of cleaning.

REASONABLE PRICE

Type L-30	500-watt floodlighting	$60.00
Type L-31	1000-watt floodlight (illustrated above)	85.00
Type L-29	200/250-watt floodlight	47.00

Above include 4 ft of cable and base. Attachments for pipe mounting at no additional charge. All prices list including freight charges.





GENERAL ELECTRIC

Filing No. 3200

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goin' SUCCESS! places!

A wireman's helper named Carr
Joined a flexible bus to a bar.
A Burndy connection,
It stood for perfection—
"Young Carr," said his chief, "should go far."

BURNDY BARTAP — type QAF — combination bar tap and A-clamp for tapping a cable from a bar without drilling holes through bar. A-clamps, bolts and nuts all made of Everdur. Made in sizes covering cable range from #2 to 2000 Mcm.

BURNDY

ENGINEERING COMPANY, INC. • 459 E. 133d ST., NEW YORK, N.Y.

★ LIGHT the Job WITH Localite ★

Specialized Engineered UNITS FOR EVERY LOCALIZED LIGHTING NEED ★

Spots High Intensity Light Directly on Working Area

FLEXIBLE fostoria LOCALITE

UNI-FOCAL LIGHTING UNIT

Reflecting light rays into a converging beam, the Fostoria Uni-Focal unit provides a degree of light intensity exceeding that of any other small reflector. It is ideal for use where highly accurate seeing is required over a small working area. The Fostoria Supporting Arm permits instant adjustment of the light exactly as wanted. Write for catalog of Fostoria Localites in various types engineered for specific lighting requirements.

THE FOSTORIA PRESSED STEEL CORP.
FOSTORIA, OHIO

In the News

[FROM PAGE 70]

type of equipment were presented and discussed at length.

In outlining the hazards from overheated floors, ceilings and joists, Ken W. Keene of Underwriters' Laboratories stated that tests could be made of such fixtures to determine whether their design was adequate to insure proper ventilation and radiation. According to Fred D. Weber of Portland, the consensus of the convention was to permit the installation of only such fixtures as had been tested and labelled as being approved for recessed or flush installation.

STANDARDS FOR SIGHT-SAVING CLASSROOMS

Children with seriously defective vision have been given recognition in Ohio through the preparation of regulations for lighting Sight-Saving classrooms in that state. This is the outcome of lighting standards agreed upon by a committee of sight saving supervisors, oculists, lighting experts and directors of schools, called together in December 1936 by the State Department of Education.

School superintendents have been advised that these regulations would govern, and that re-equipping of classrooms to meet the new standards should be carried out as rapidly as funds are available for this purpose.

The regulations cover: (1) Size of sight-saving classroom, (2) Orientation of building, (3) Quality of lighting, (4) Glare, (5) Diffusion, (6) Ceiling and wall colors and finish, (7) Control of natural illumination, (8) Minimum level of illumination, (9) Artificial lighting, type and control, and other topics.

LABELS ON CORD SETS

It was announced by Underwriters' Laboratories, Inc., that on and after April 1, 1938, all approved cord sets would be identified by a label. Labels will be available January 1, 1938, and may be applied from that date on. Reexamination Service heretofore in force on cord sets, will be discontinued April 1, and all approved cord sets must thereafter bear a label. Labelling is expected to be of advantage to both manufacturers of listed products and to purchasers of these products.

Labels chosen for use on cord sets are circular kraft paper tags of blue, 1 in. in diameter with a ¼ in. diameter hole in the center. They bear the wording: "Underwriters' Laboratories, Inc.'s Inspected Cord Set," the Manufacturer's name and an issue number, in black lettering. These labels are to be slipped over the cords before final assembly of the end fittings. One label will be used on each listed cord set.

Send for these NEW DATA

This recent literature, issued by leading electrical manufacturers, has been listed by number for your convenience. Please check on the post card any of this material you would like to receive. It will come to you without cost or obligation.

SWITCHGEAR

1. Bulletin GEA-2605 describing switchgear equipment, switches and devices, air circuit breakers, oil circuit breakers, power switching equipment, indoor and outdoor switchgear relays. General Electric Co.

MACHINING ALUMINUM

2. A revised edition of the booklet "Machining Aluminum" containing detailed data on machining of aluminum and its alloys. Aluminum Company of America.

PANELBOARD

3. Folder No. 97 on Converti-Fuse, the new interchangeable unit panelboard for convertibility and safe fuse replacements. Includes description, illustrations and diagrams. The Trumbull Electric Mfg. Co.

POWER PUMPS

4. Bulletin 6130 describes a new line of duplex power pumps, for oil field service, fire protection and general service requiring pressures up to 800 pounds per square inch and capacities to 187 gallons per minute. Fairbanks, Morse & Co.

LAMPS

5. Booklet entitled "How to Judge a Lamp," tells what to look for in purchasing an incandescent lamp to insure getting most for your money. Westinghouse Electric and Manufacturing Co.

WIRING DEVICES

6. Catalog No. 37 consisting of 100 pages, spiral bound, on wiring devices classified in groups for convenient selection. Sections on lampholders, connecting devices, flush switches, surface switches, flush plates, interchangeable unit devices, rosettes, fuses and cutouts, wiring data, product index, catalog number index and list prices supplement. The Bryant Electric Company.

HOT WATER CONTROL

7. Bulletin No. 125 describing Type 115-W Mercoid Immersatherm year-round hot water supply control, used with steam, vapor and hot water systems employing indirect domestic hot water heaters. Includes illustrations. The Mercoid Corporation.

MOTORS

8. A 24-page book on characteristics and applications of all types of fractional horse power motors, and suggestions as to how they can be most effectively applied to meet the requirements of motor-driven machinery and appliances operating in normal or abnormal surroundings. Many illustrations. Bulletin 1039-R. Century Electric Company.

STELLITE LIBRARY

9. Small booklet lists and briefly describes eighteen Haynes Stellite books, reprints and folders dealing with hard-facing alloys, cutting tools and alloys for chemical processing equipment. Summarized and grouped under five sections —for the machinist, general maintenance, welder and metallurgist. Haynes Stellite Company.

INDUSTRIAL LIGHTING

10. Catalog No. 26 includes data on industrial lighting, floodlighting and signals. Consisting of 352 pages, it covers a number of specifications, engineering recommendations, floor layout plans, intensity formulae, cost and labor-saving hints, lighting efficiency curves and installation illustrations. Benjamin Electric Manufacturing Co.

INSTRUMENTS

11. Catalog No. 15 describes ammeters, voltmeters and wattmeters comprising three different systems, "moving coil", "electro-magnetic" and "electro-dynamometer". Norton Electrical Instrument Co.

SPLASH-PROOF MOTORS

12. Bulletin 122 features splash-proof Type AA motors, Form P. 2 and 3-phase a.c. squirrel-cage. Reliance Electric & Engineering Company.

SOLDERING POT

13. Folder describing "Junior" Electric soldering and melting pot, particularly adapted for motor repair work. Lists features and specifications. Newton Junior Corporation.

TIME SWITCHES

14. Bulletin GEA-2293-A features type T-10 astronomic time switch, pole-base type for control of street lighting. Also other installations where minimum space is a major requirement. General Electric Company.

BRAZING ALLOY AND FLUX

15. Bulletin No. 5 describing Sil-Fos brazing alloy containing silver. Bulletin No. 9 features a new flux for low temperature brazing. Handy & Harman.

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ELECTRICAL CONTRACTING

330 West 42nd Street

30th Floor New York, N. Y.

TRANSFORMERS

16. Bulletin No. S-401 illustrating and describing distribution and power transformers built to AIEE and NEMA specifications. Standard Transformer Co., Warren, Ohio.

TWIST-LOCK

17. Folder describing Twist-lock devices for continuous uninterrupted service, in the operation of motor-driven tools and equipment by providing a locked electrical connection. Harvey Hubbell, Inc.

OHM SCALES

18. Bulletin 1535 describing improved ohm scales for "Meg" and "Super Meg" insulation testers to measure conductor resistance, as well as insulation resistance, with same instrument. James G. Biddle Co.

ELECTRICAL PRODUCTS

19. Catalog 60 consisting of 416 pages of Colt Noark electrical products. Sections on safety switch, industrial control, meter service and entrance switch, fuse, cast iron service and fuse box. Includes price list. Colt's Patent Fire Arms Manufacturing Co.

WINDOW ILLUMINATION

20. Folder describing Fresnelite a "soft edge" spot or flood for window lighting. Illustrations and installation pictures. Also units for ceiling illumination. Century Lighting, Inc.

FINGERS AND SEGMENTS

21. A folder covering modern fingers and segments to reduce maintenance costs and improve operating reliability. Includes tables on individual fingers for various types of drum controllers. Bulletin GEA-2145A. General Electric Company.

MELTING POTS

22. Leaflet 11-TE featuring electric melting pots and other electrically heated industrial equipment. Includes specifications and illustrations. Harold E. Trent Company.

WELDING AND CUTTING

23. A small booklet of 68 pages listing Linde distribution, sales and service facilities, ready to supply you with everything for oxy-acetylene welding and cutting. Linde Air Products Company.

TRANSFORMERS

24. A folder, Form S527, on air-cooled transformers, type AC, general purpose, and type AA auto-transformers. Lists application, and advantages, Includes illustrations, sizes and ratings available. Wagner Electric Corp.

WATTHOUR METERS

25. Catalog GEA-615E lists information, data and illustrations on single-phase, two-element single-disk, polyphase types D-14 and D-15, switchboard a.c., direct current meters, watthour-meter standards, accessories and supplies. General Electric Company.

LIGHTING EQUIPMENT

26. A folder describing the new indirect lighting unit known as Ancoda, for controlled high-intensity requirements. The Edwin F. Guth Company.

DISTRIBUTION PERMITTORS

27. A folder featuring small unit type, Class U, distribution permittors for pole mounting. Includes photographs and sketches. Products Protection Corp.

CONTROLS AND REPLACEMENTS

28. A manual, pocket size, consists of listings of exact-duplicate and standard volume controls and resistor-tube replacements for all standard types of radio sets, as well as circuit diagrams, servicing hints, ballast data, attenuator data. Clarostat Mfg. Co., Inc.

LUMINARIES

29. Catalog Section 61-258 describing direct-indirect lighting for store interiors with Storlite luminairies. Includes construction, light distribution curve and average lighting intensities for various spacings and mounting heights. Westinghouse Electric and Manufacturing Co.

DUST

30. Booklet entitled "Pertinent Questions and Answers Concerning Dusts". Tells the nature and effects of dusts in simple and non-technical language. Mine Safety Appliance Company.

FOOTBALL FLOODLIGHTING

31. A 48 page practical treatise on sport field floodlighting for night play. Includes action photographs of illuminated field, technical and practical installation data. Opinions of famous coaches and players on night playing, tables of increased attendance. Benjamin Electric Manufacturing Co.

WELDER

32. A booklet describing inherent requirements of the arc welding generator and application in the Hansen smoothare welder. Harnischfeger Corporation.

A.C. MOTORS

33. Bulletin 124 featuring explosion-proof a.c. motors, Type AA for Class I, Group D hazardous locations. Includes illustrations and cross-sectional view. Reliance Electric & Engineering Co.

TRANSFORMERS

34. Bulletin S-201 covers dry type transformers for indoor or outdoor service in restricted locations. Includes data on construction, types, dimension tables. The Standard Transformer Co.

ANTENNA SYSTEM MANUAL

35. This manual covers profit-making possibilities of master antenna system as applied to apartment houses and other large buildings, and individual dwellings. Deals with theory, installation and operation of system as well as survey of buildings and estimating. Technical Appliance Corp.

LAMPS

36. Bulletin 1530 describing "Pointolite" lamps, used as sources of light in conjunction with laboratory and scientific apparatus. James G. Biddle Co.

CIRCLE NUMBERS-SIGN-AND MAIL

ELECTRICAL CONTRACTING **December**
(Not good after March 1)

Please send me, without obligation, manufacturers' literature herein described and identified by numbers circled below.

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18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
33 34 35 36

NAME..... TITLE.....
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COMPANY .....
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CITY .....STATE .....

Please write direct to the manufacturers for the following:

FILM ON CABLES

The Okonite Company, Passaic, New Jersey, has just completed a new two reel sound film showing how rubber insulated wires and cables are made and used. Lowell Thomas is the narrator. It will be shown without charge in 16 mm. and 35 mm. sizes to groups interested in this subject.

PORCELAIN ENAMELING

A booklet on Production of Castings for Porcelain Enameling. Data and information gleaned from observing practices in enameling plants and foundries. Price 10 cents. Porcelain Enamel Institute, Inc., 612 N. Michigan Ave., Chicago, Ill.

Risky Raceways

Recent re-wiring of the Paterson, N. J. courthouse building by J. R. De Mott, Inc. called for replacing an unusual system of wires and raceways dating back to 1902. It seems that thin-walled wood-lined tubing was originally installed. But the wood linings became swollen by dampness during a delay in construction and before wires could be pulled in, these liners had to be removed. Thus Paterson got one of its first systems of conductors in unlined metal raceway.

REPARATIONS DE MOTEURS — A wooden model motor suspended below this sign decorates the front for the Electrical Rewinding Shop of Quebec. Here brothers Adolphe (left) and Theodore Dombrowski, take care of ailing motors for this French-speaking metropolis.

Coded Sleeving

The use of color-coded sleeving for motor rewinding work is a time and error saving measure. F. G. Allan of the Elliott Electric Co. of Cleveland has found it so, and passes the word.

This company maintains an unusually large stock of lamps to give prompt service to its industrial accounts. They also supply the contract needs of the city of Cleveland in its various municipal buildings.

Paging Rube Goldberg

One of those intricate contraptions where the cat jumps on lever "A" trips catch "B", energized by spring "C" etc., etc., was recently in evidence at the Mountford-Hopkinson Electric Co., in Portland, Me. But it wasn't a mouse trap, but only a very rusty series of levers, springs and contacts which formed a rustic door bell system for one of the summer estates.

"ROME-CABLE"
BUILDING WIRE

What Do You Get For Your Dollar?

"Rome Cable" high efficiency wire and cables have the background of a basic rod processed in our own rolling mills where every movement is under skilled observation, scientific test, and rigid inspection.

In every type of wire and cable, we promise uniformity of gauge, temper, insulation, finish and package, so when you specify "Rome Cable"

You Get a Great Deal For Your Dollar

ROME CABLE QUALITY

Code, Intermediate 30% and Superaging
Slick finish for Quick and Easy Pulling
Long Aging Rubber
Approved by the Underwriters Laboratories, Inc., N.E.C.S.
Uniformly Small Diameters
Clean — Easy Stripping
Flame and Moisture Resistant
Eight Clear Distinct Colors

ROME-CABLE ROME, N.Y.

PRODUCTS — Hot rolled rods, bare and tinned copper wire, bare and tinned strand, U.R.C. weatherproof wire, cotton, paper and asbestos magnet wire, rubber insulated wires and cords, lead covered cables.

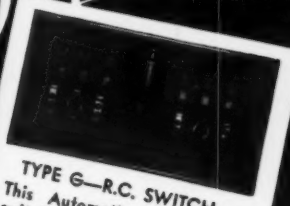
ROME CABLE CORPORATION

SALES OFFICES—New York, Chicago, Philadelphia, Pittsburgh, Richmond, Cleveland, Boston, Dallas, Los Angeles.

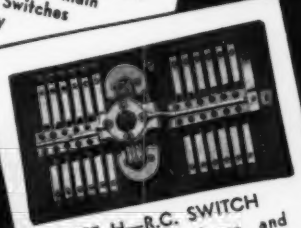
USE REMOTE CONTROL SWITCHES

DIAMOND H TRADE MARK

TYPE F—R.C. SWITCH
USE for all general applications such as flood, window, and sign lighting in office buildings, auditoriums, anywhere many circuits are used.



TYPE G—R.C. SWITCH
This Automatic changeover switch should be used wherever emergency circuits are needed as in Theatres, Schools, Hospitals where life is in danger if main supply fails. Switches automatically from one to other.



TYPE H—R.C. SWITCH
Protect the home and grounds, warehouses, docks and storage places from trespassers. Instantly light premises with from 6 to 48 poles switches.

Turning lights on and off by Remote Control Switches is the Modern way. "Diamond H" Switches are the best in design, workmanship and performance. Use them to control lighting circuits, and get credit for a good job.

Bulletin No. 10-C describes them. Write for it.

THE HART MFG. CO.—Hartford, Conn.

SHERMAN
SOLDERLESS LUGS

- LOW COST
- PRACTICAL
- STRONG
- SIMPLE
- DEPENDABLE

APPROVED BY UNDERWRITERS

Patented

UNIT ASSEMBLY PURE COPPER

Screw can't come out
Rigid assembly
No loose parts
Easy and quick to use
No special tools required
Lighter and stronger than cast lugs
Grips wire at all points

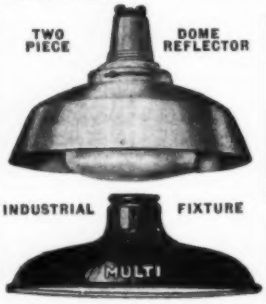
SEND FOR SAMPLES AND BULLETIN NO. 15

SOLD THRU JOBBERS

H. B. SHERMAN MFG. CO.
BATTLE CREEK, MICH.

BETTER LIGHTING with MULTI REFLECTORS

★ MULTI Two-Piece Dome Reflector has snow white diffusing glass globe held in place by MULTI quick-changing Grip-It holder with internal finger support. No breakage from vibration or expansion. Ideal for efficient lighting of factory, workshop, or office.



★ MULTI Industrial Reflectors are made in hundreds of sizes and types to meet the demand for efficient and correct lighting. Will not crack or chip. Rust-proof and easily cleaned. Specify MULTI for new and replacement work.

Write for catalog.

MULTI ELECTRICAL MFG. CO.
1840 W. 14th St.
CHICAGO

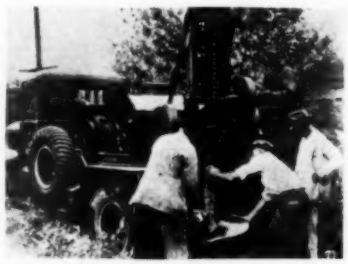
More Gouge

Institutional Service

With a 20-year record as an electrical contractor, John Dibble of St. John, N. B. demonstrates how a steady business may be built up by service for local institutions. Dibble lists hospitals, several orphanages for boys and girls, and homes for aged men and women in his list of customers. Reaching out for more business of this sort, he also takes care of a private school for girls, a church, a chapel, and a public school.

Modernizing Opportunist

While claiming to be out of the new construction business, S. W. Drucker of the Independent Wiring Co., Inc., Philadelphia, keeps an electrical engineer and a sizeable gang busy, as specialists in modernizing occupied business properties for real estate firms and trust companies. Drucker's jobs run from building maintenance and tenant changes, to the conversion of steam plants to purchased power.



SUPER-DIGGING—*Mass production of 14-ft. holes for power transmission towers along an eastern railroad right-of-way prompted the development of this super-boring outfit. Mounted on a four-wheel drive truck, there is an 18-ft. tower and 20-ft. augur shaft for 30-in. or 36-in. diameter augurs. The boring mechanism is on a turntable, so that the operator may dig holes on either side of the truck or behind it. Photo by Four Wheel Drive Auto Co. shows the augur being set for a high-speed 14-ft. trip into the ground.*

More Paper Output

Things are booming around the Montreal office of the Canadian Comstock Co. Ltd. Work is getting under way on Canada's largest construction project, a $15,000,000 paper mill and hydro power station at Como Bay near the mouth of the St. Lawrence River. The Comstock organization has all the heavy power equipment to install in its wiring contract.

HISTORY MAKER—When the city of Quebec saw its first electric lights shine forth, A. P. Doddridge was one of the wiring wizards. Since 1904 he has been operating his own business, the Quebec Electric Co., a contracting and retail business which caters to the better homes and commercials. Mr. Doddridge took time out this spring for a visit abroad to swell London's Coronation throngs.

Whopper Bell Jobs

A New York City electrical inspector found a five-ton truck filled with various sizes of sub-standard pipe which was being delivered to a certain jobber. Later the chief inspector of the borough in which this jobber is located called upon the jobber in person and warned him that this pipe would not be approved. The jobber's reply to the chief inspector was, that he knew it was not approved pipe and intended to sell it only for bell work. It is very hard for the inspection department to believe that contractors are employing 1" to 3½" conduit for bell work.

Accordingly all inspectors have been warned to watch out for this sub-standard conduit, particularly in the territory where this jobber operates, and to place violations wherever this conduit is found installed.

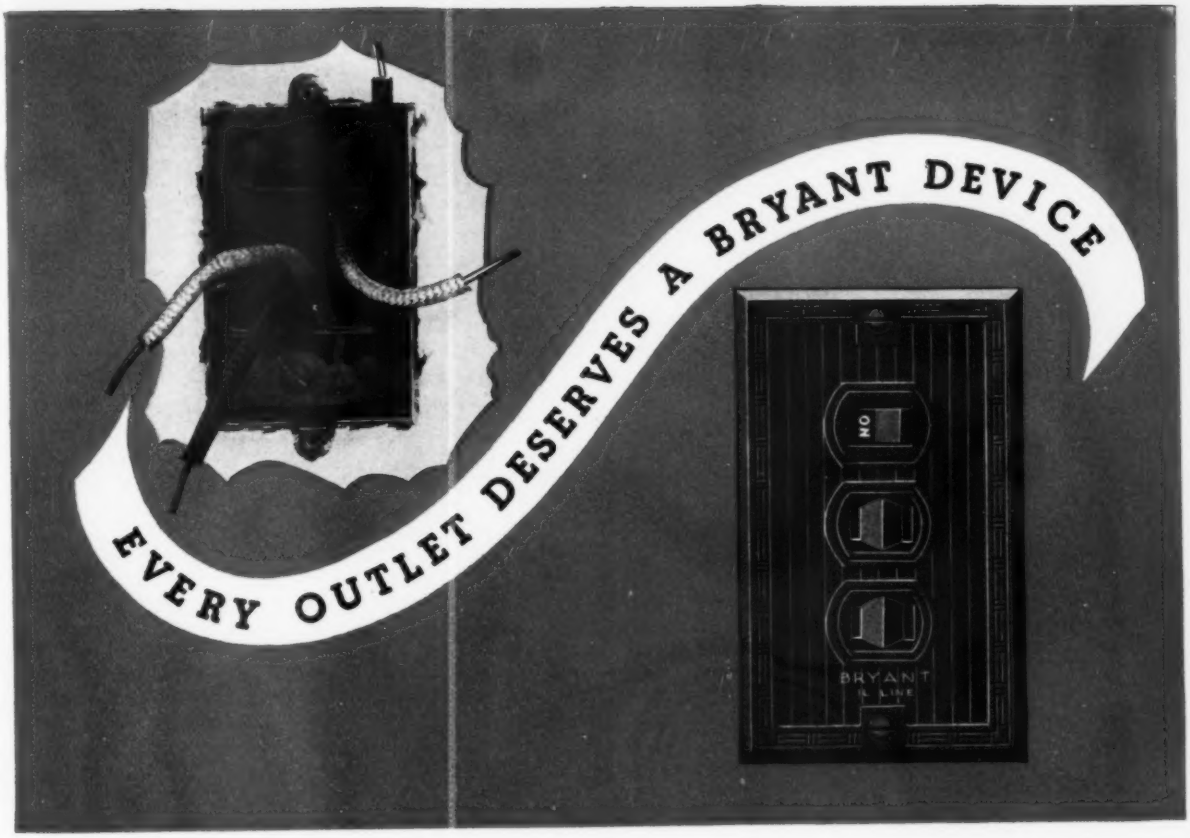
More for George To Do

Charles George, president of the Norfolk Electrical Contractors' Association, and well-known in Massachusetts electrical contracting circles, has acquired the electrical business of Fred Hartshorne in Walpole, Mass. A new concern has been set up under the name of the Charles George Electrical Company.

Balanced Volume

When the contractor goes appliance-wise, good displays help sales crews build business from a quality wiring clientele. An example of how to make the most of it may be seen at the handsome quarters of Alexander H. McDaniel, Inc., Wilmington, Del.

UMI



When your problem is COMPACTNESS

● When limited wall space presents a problem, or when a more compact, attractive installation is desired, Bryant has the solution.

With the Bryant IL Line, any combination of two or three devices can be used in the space of a single gang box. Always ample space for easy wiring.

BRYANT
WIRING DEVICES

These devices are furnished in brown or ivory to harmonize with decorations.

Consult the Bryant easy-to-use catalog for complete listings.

Sold through Electrical Wholesalers

THE BRYANT ELECTRIC COMPANY · BRIDGEPORT, CONNECTICUT
NEW YORK: 100 East 42nd St. · CHICAGO: 844 West Adams St. · SAN FRANCISCO: 325 Ninth St.

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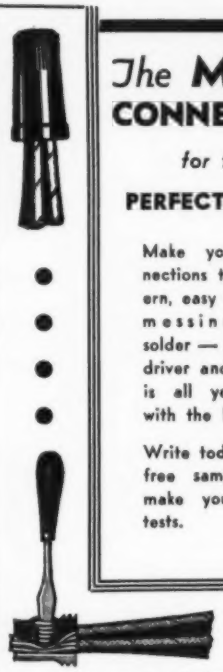


The MARR CONNECTOR for the PERFECT JOINT

Make your connections the modern, easy way. No messing with solder — A screwdriver and a twist is all you need with the MARR.

Write today for a free sample and make your own tests.

Approved by Underwriters

THE RATTAN MANUFACTURING CO.

552 STATE STREET
NEW HAVEN, CONN., U. S. A.

GENERAL SALES AGENTS HATHEWAY AND CO.
220 CHURCH STREET NEW YORK, N. Y., U. S. A.

For

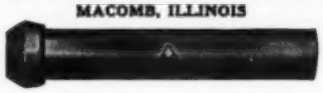
Residence Wiring

The Best and Safest Method is a properly installed KNOB and TUBE job. Be sure and get the

TRADE MARK Bull Dog REGISTERED

Assembled Knob because it "HAS A GRIP LIKE ITS NAMESAKE."

ILLINOIS ELECTRIC PORCELAIN CO.
MACOMB, ILLINOIS



Rural Inspection

[FROM PAGE 11]

run for five years at a low rate of interest, payable at the convenience of the farmer. This enables many farmers to take advantage of electric current as soon as the lines are energized.

Funds secured from these loans may be applied in many ways. Some of our borrowers have successfully used a plan of group bidding. This plan involves the surveying of individual farmer's requirements, grouping the surveys and inviting bids in lots of 25 or more. In this way each individual farmer gets the benefit of a sound financing plan designed for his benefit, gives him the advantage in price which any contractor will allow on a large job, and assures the farmer a safe and adequate wiring job, properly inspected. Under such a plan none but competent contractors are likely to come into the picture.

With this system there will be a uniformity of work which is desirable, and undue delays are obviated. The desire and need is to have farmsteads wired and ready to use the current as soon as the distribution lines are energized. This works to the advantage of the individual farmer and to the project in the immediate and wider use of current.

In some sections there have been delays because there have not been enough electricians to promptly carry through the work on such contracts, and work on individual farms wired independently. Following that, there has been a shortage of inspectors.

Lack of Inspectors

Only urban users of electric service have the protection of municipal laws covering inspection. REA believes that all new users of electric current on their lines should have adequate inspection. We have found a great lack of qualified men to do this work. The result has been no inspection at all in some instances, or long and serious delays on some projects. Plans are being worked out to remedy the situation. Under one procedure effective in several states trained electricians are selected, who are of high integrity and good standing in the community and who will serve the people efficiently and honestly as inspectors. Under the direction of State Directors of Vocational Education, Fire Underwriters, or others who are qualified and available, they are given a week or ten days of training in wiring inspection, according to underwriters' requirements. These men are then appointed as accredited inspectors of the Fire Marshal's office, making the inspection service independent of distributing organizations.

It is believed that with this minimum training, the immediate problem of timely and speedy inspection will be met without delay. But with thousands of farmsteads being wired for high line service and the number increasing day by day, it takes no imagination to see the situation.

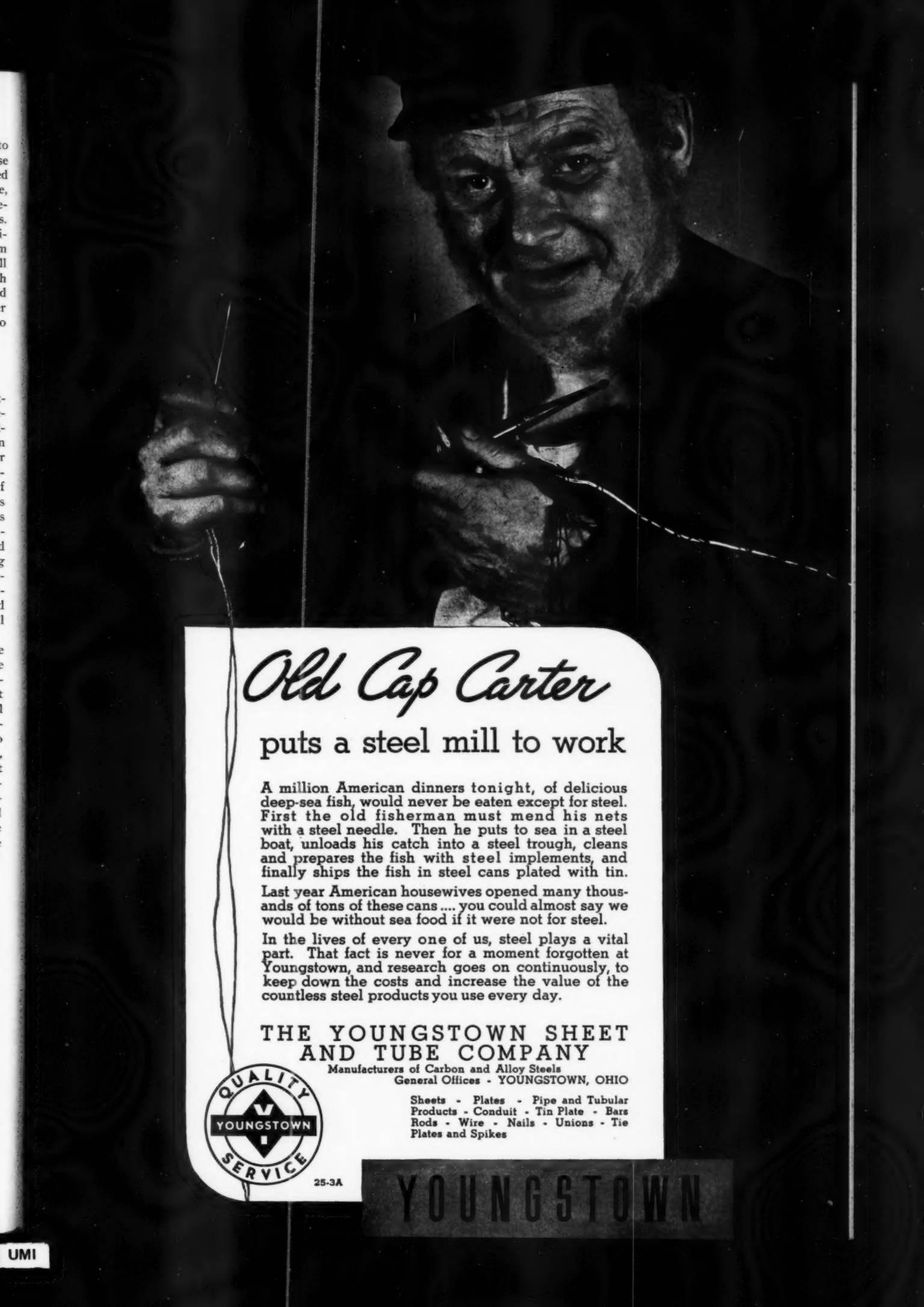
Twenty-five States

As soon as it is known that a suitable inspection system has been devised for a particular state, the Administrator advises all borrowers in that state that in order to protect their customers from the hazards of defective wiring and for the protection of the borrower's organization, it is necessary that all wiring installations be inspected and approved by an accredited inspection agency, approved by the Administrator, before being connected to their lines. It is of interest to note that a system of inspection is now in effect in 25 states and that negotiations are under way in all the other states.

We do not consider these steps we have taken as adequate to meet the future national requirements of electrical inspections. Far from it. But we are attempting to temporarily fill a need, and an obligation. The National Committee, recently formed to work out minimum code requirements, will undoubtedly survey the present and future needs of a nationwide inspection service with vision and practical knowledge. But their work will mean very little if it does not have the support of all whose interests converge at every safe, adequately wired and well inspected farmstead.

Need Higher Standards

It is my belief that no part of my building investment on a farm pays more diversified, continuous economic and social dividends than does the wiring system. However, if we are to meet our responsibilities and obligations we should plan way ahead for modern American farm homes. With good lighting and labor saving equipment commonplace, air conditioning just around the corner, and television not far behind, we must use science and ingenuity to set higher and better standards for converting houses into homes. Wiring must keep pace.


Old Cap Carter
puts a steel mill to work
A million American dinners tonight, of delicious deep-sea fish, would never be eaten except for steel. First the old fisherman must mend his nets with a steel needle. Then he puts to sea in a steel boat, unloads his catch into a steel trough, cleans and prepares the fish with steel implements, and finally ships the fish in steel cans plated with tin.
Last year American housewives opened many thousands of tons of these cans .... you could almost say we would be without sea food if it were not for steel.
In the lives of every one of us, steel plays a vital part. That fact is never for a moment forgotten at Youngstown, and research goes on continuously, to keep down the costs and increase the value of the countless steel products you use every day.
THE YOUNGSTOWN SHEET AND TUBE COMPANY
Manufacturers of Carbon and Alloy Steels
General Offices - YOUNGSTOWN, OHIO
Sheets - Plates - Pipe and Tubular Products - Conduit - Tin Plate - Bars Rods - Wire - Nails - Unions - Tie Plates and Spikes
QUALITY
YOUNGSTOWN
SERVICE
25-3A
YOUNGSTOWN

About NECA

CONVENTION PROCEEDINGS

All of the addresses given at the Convention in Los Angeles have been compiled and published by NECA in its November issue of "The Qualified Contractor". Copies of this issue have gone to every member of NECA and also to all members of the industry registered at the Convention. In their report to the Convention the Resolutions Committee made the statement:

"We want to commend to every delegate present at this Convention and to every member of our Association to whom the proceedings of this Convention will go, that they make the printed record of these addresses a source of study and guidance.

In glancing through the published proceedings the following are a few samples of fine thoughts expressed by the speakers:

"In the Electrical Industry, as in any private business, there comes a time to act. That time is here *now*—the time to begin to combat the deadly, strangling effect of inadequate wiring."

"We are all engaged in building some type of a structure. It just happens that our structure is the electrical industry and the structure that should be our ideal is a unified industry in which the coordinated effort and thought of the utility, manufacturer, distributor, contractor and dealer is on delivering the highest type of service."

"The electrical contractor has a wonderful opportunity as well as a responsibility to inform his clients of the many uses that can be made of electricity. . . ."

"Why not serve your own business better by thinking of, and working for *me* (your customer) more?"

"As electrical contractors, you are expected to be interested in lighting and advocate its use if for none other than a business reason." (Highway-Lighting).

"Lack of cooperation between competitors is usually due to misunderstanding. . . . Cooperation among competitors will steadily increase as long as they are assured that it is possible. . . ."

"Will this work?" (This cooperation)—"I am here to tell you that you can make it work if you want to. . . ."

"How do you like the cake I made for my little girl's birthday?"

JOB PROTECTION CONTRACTS

There was brought before the Convention a communication indicating dissatisfaction on the part of the manufacturers with the present conditions affecting protection contracts on specific building jobs and indicating the possibility of abolishing all protections on specific jobs. It was voted by the Convention that this matter be referred to the Executive Committee for action in protection of the contractors' interests.

A CODE OF ETHICS

In his paper presented to the Los Angeles Convention entitled "An Electrical Industry Fair Trading Policy", Ralph M. Walker, Chairman of NECA Distribution Committee, submitted the following recommendation:

"We should work out through the Executive Committee, or through a special committee, a definite Code of Ethics that we would like to see adopted, and to which we could guarantee through our pledge that our entire membership would conform. We should then authorize the officers of the Association to invite the other branches of the industry to appoint members to a general committee to discuss the proposed plan and set up a Code of Ethics for the industry to which any one could conscientiously subscribe."

It was unanimously voted by the Convention that the Executive Committee create a committee to carry out the objectives of the above recommendation. Pursuant to this resolution, the Executive Committee voted that all members of the Executive Committee be designated as members of the Distribution Committee, with Ralph M. Walker as their chairman, and with a special sub-committee to be appointed to handle contacts with the other branches of the industry.

ADEQUATE WIRING PROGRAM ENDORSED BY CONVENTION

At the recent NECA Convention in Los Angeles the central theme of which was "Electrical Adequacy", covering "adequate wiring" in its broad sense. This included commercial as well as domestic wiring, industrial lighting and modernization, highway lighting, and other forms of electrical utilization. The Resolutions Committee therefore submitted the following resolution which was unanimously adopted by the Convention:

WHEREAS National Electrical Contractors Association has declared its policy to be the extension of electrical service to the greatest number of users, and

WHEREAS there has been inaugurated a National Adequate Wiring Program designed to develop and maintain a broad program of education of the public, both nationally and locally, to present to the public in simple convincing language the new and dramatic story of adequate wiring, and

WHEREAS there has been set up a National Adequate Wiring Bureau representing all branches of the industry coordinated to carry out this national program;

THEREFORE BE IT RESOLVED, That National Electrical Contractors Association wholeheartedly endorses this National Adequate Wiring Program and pledges cooperation in promoting the program through all of the resources of the Association, and

BE IT FURTHER RESOLVED, That we urge all Chapters and Local Associations of Electrical Contractors, and all individual members of our Association to cooperate through local programs designed to gain the greatest possible benefits from the National Adequate Wiring Program in their communities.

In connection with the program of the National Adequate Wiring Bureau, the Plan Committee of the Bureau has been actively engaged during the past few weeks in developing its program. It is expected to soon be ready for presentation.

Material for this department is supplied by the headquarters staff of the National Electrical Contractors Association, 420 Lexington Avenue, New York.

POLICY—

. . . *Not just an idea!*

Accomplishments reflect policy.

From scratch to "The Jobs You Read About" in so short a time, has been termed a stroke of genius.

Genius?—Poof! Triangle products reward buyers . . . *and the news spreads.* So, Triangle gets the business.

Resources are in product and production improvement, not dissipated in scouting for buyers.

If this policy didn't pay our customers and ourselves, we'd scrap it.

We just wont stick to a losing idea.

TRIANGLE CONDUIT & CABLE CO., INC.
Horace Harding & Queens Blvds. ELMHURST, NEW YORK CITY, N. Y.

ARTERIES FOR ELECTRICAL

INCORPORATED

SYSTEMS

It MUST *be right!*

UMI

WITH THE *Manufacturers*

Clark Now President

Bonnell W. Clark has been elected president of the Westinghouse Electric Supply Co. He entered the wholesaling business in 1906 with the Robertson-Cataract Co. of Buffalo and, except for a period of four

BONNELL W. CLARK

years when he was sales manager of the Gould Battery Co., has been continuously in electrical wholesaling.

On January 1, 1925 Mr. Clark joined the Westinghouse Electric Supply Co. as a special representative. In 1929 he was named general manager and became vice-president and director in 1932. From 1930 to 1932 he was chairman of the National Electrical Wholesalers Association.

•

Waterbury Cable Company of Brooklyn N. Y. has moved into new and larger quarters at 253 Classon Ave., Brooklyn. They have installed some new and up-to-date manufacturing equipment and their present factory now occupies over 6,000 sq. ft. of manufacturing space.

•

Clifford W. Stuart, secretary of the General Electric Company's appliance sales committee and, for the last six months, assistant manager of the G. E. Home Bureau, has been named manager of the Home Bureau. Carl M. Snyder, formerly manager of the Home Bureau, has been appointed manager of appliance sales.

Graybar Electric Company has appointed J. E. Murray, formerly outside construction manager at Kansas City, as manager of its house at Wichita, Kansas. W. A. Arthur of Oklahoma City and S. B. Hardin of Denver, have been made managers of their respective houses.

•

Dongan Electric Manufacturing Co. of Detroit, announces the appointment of Walter C. Keegan, as direct factory representative in the middle west territory. He will make his headquarters in Elgin, Ill.

•

McGill Manufacturing Co. of Valparaiso, Ind. has increased the territory covered by its Detroit representatives, Turrell & Benfield, Inc. to include the cities of Cleveland, Akron, Canton and Youngstown, Ohio.

•

Frank S. Montgomery has been named advertising manager of General Shaver Corp., a division of Remington Rand, Inc. Mr. Montgomery was formerly advertising manager of Bryant Electric Company.

P. C. Brooks Dies

Percy C. Brooks, former executive vice-president of Fairbanks, Morse & Co. died at his home in Chicago October 15 after a lingering illness of about a year. He was 65 years old.

•

Arthur T. Cox, Jr. has been appointed manager of welding in the Tri-Cities sales-engineering office of the Lincoln Electric Company located at Moline, Ill. He is succeeding J. B. Flock, who is taking a year's leave of absence.

•

Paul Davis has been appointed sales and engineering design representative of the Holophane Co. for the states of Oregon and Washington. His headquarters will be at the General Electric Supply Company in both Seattle and Portland.

•

J. A. Proctor has been appointed assistant manager of the General Electric Company air conditioning department. Mr. Proctor for the past three years has been assistant to Vice-President C. E. Wilson. He will make his headquarters at Bloomfield, N. J.

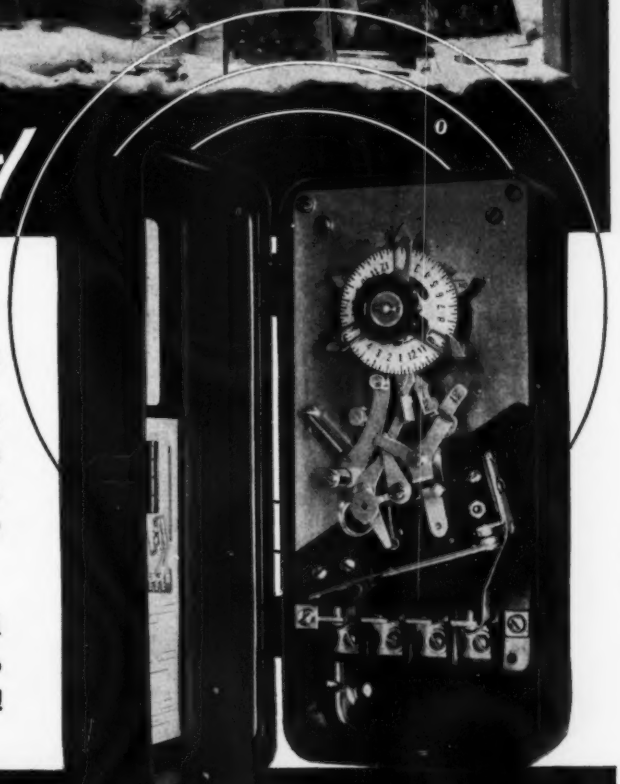
•

Warren Telechron Company of Ashland, Mass., has appointed David Blair, Jr., formerly supervisor of order service section, district manager of the St. Louis territory, succeeding A. A. West. Mr. West has been transferred to the Chicago office as district manager, succeeding W. L. Howell.

MOTOR BOSSES—Westinghouse executives inspect the new mass production motor aisle in East Pittsburgh plant, where a special layout insures smooth manufacturing sequence for one to fifty h.p. a.c. motors. Before an automatic conveyorized punch press for stator and rotor laminations, stand vice-president Ralph Kelly (center), R. W. Owens, motor division manager and George Ryan (right), superintendent of this 270,000 sq. ft. motor aisle.

UMI

the Unseen Hand



that makes this installation

Completely Automatic

Installed right now, the Unseen Hand easily earns its cost by Christmas:—it will add hours of sales stimulation by lighting window displays after closing time.

Store-keepers are receptive to this kind of reasoning—and for you, Sangamo Time-Switches are a profitable item!

SANGAMO ELECTRIC COMPANY

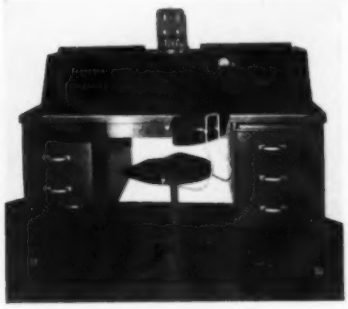
SPRINGFIELD, ILLINOIS

UMI

EQUIPMENT News

Test Table

This test table is specially adapted to testing meters, instruments, relays and transformers. Entire control panel is dead-front and meter position is adjustable back and forth to any preferred position. Insulation testing arrangement provided. Convenient drawers furnished for tools, parts and leads and equipment. Has fully inclosed wiring and bus connections; panel illuminated by hooded fixtures. The States Company, Hartford, Conn.



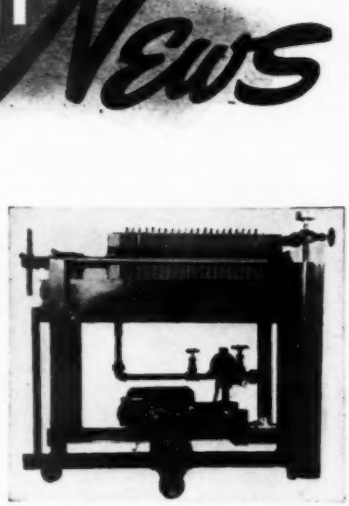
STATES CO. TEST TABLE

■

Neon Transformer

Autopak is a neon transformer to illuminate neon signs and displays installed in automobiles, for day and night use. Low voltage direct current of automobile battery or generator is converted to alternating current and voltage increased through a transformer that meets requirements of luminous tube operation. Average operation requires approximately three amperes. To install, primary connection is made to battery or starting cable and other lead is grounded to body or frame. Secondary connections are made to tubing. Acme Electric & Mfg. Co., Cuba, N. Y.

ACME AUTOPAK



WESTINGHOUSE OIL FILTER PRESS

Oil Filter Press

A line of oil filter presses for cleaning and drying insulating oils. Light in weight, have low power consumption and are quiet in operation. Include pump bypass through a ¼-in. needle valve to test suction line for leaks; small tank providing primary gas trap; discharge flow taken from bottom of filter sections, providing secondary gas trap. Drip pan may be removed for cleaning by disconnecting one pipe union and four belts. Standard outfits rated 5, 10 and 30 gallons per minute for 60 cycle, 220-volt supply. Westinghouse Electric & Mfg. Co., Pittsburgh, Pa.

■

TRICO LEVEL OILER

Level Oiler

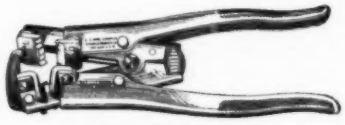
A line of constant level oilers, called Levomatic, for automatically maintaining an accurate level of oil in ring and ball bearings of motors, line shafts, pumps and other machinery having oil wells. As oil is consumed in bearing chamber, it is automatically replaced with fresh oil from reservoir. Glass reservoir is screwed to fitting. Trico Fuse Mfg. Co., Milwaukee, Wis.

G.E. AIR CIRCULATOR

Air Circulator

A new line of air circulators known as Type HVID consists of motor mounted on resilient base and directly connected to large aphonic axial flow fan, protected by a sturdy guard. Provides adequate circulation for an average eight to ten room house and will lower temperatures from five to ten degrees. For quiet operation, two-speed models with three-position tumbler switch are available. Standard mounting consists of steel strip tripod base, three inches high, which can be fastened by screws to any horizontal surface. Cost of operating circulator is approximately a cent an hour. Heat, odors and smoke from industrial processes can be quickly removed. General Electric Company, Bloomfield, N. J.

■



PYRAMID WIRE STRIPPER

Wire Stripper

The E-Z automatic wire stripper is provided with a lever, which stops return of arms until wire is removed after stripping, then it is snapped quickly back to normal. Designed for wire with insulation from .050-in. to 5/16-in. For use with solid conductor wire, stranded lamp and fixture wire, stranded automotive wire and junction work. Pyramid Products Company, 2309 South State Street, Chicago, Ill.

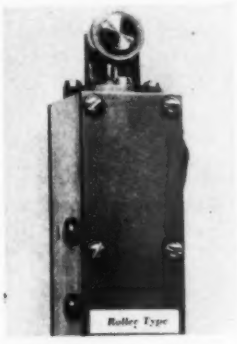
■

Arc Welding Electrode

An arc welding electrode "Fleetweld 9", for flat welding of deep-groove joints in mild steel. For industrial use on tanks or pressure vessels, utilizing heavy plate contruction. Provides weld deposits possessing high physical properties. Tensile properties vary somewhat with composition of plate, heat of welding, capacity of plate and size of electrode used. Designed to operate with either alternating or direct current. Available in three sizes, 5/32-in., ¼-in. and 5/16-in. Lincoln Electric Company, Cleveland, Ohio.

Super-Sensitive Switches

A line of switches for use at line voltages in a wide range of applications such as limit switches, counting devices, time-delay mechanism, pressure controls, liquid level, etc. Rated 10-amp. at 125-volts a.c., and 2-amp. at 600-volts a.c., these switches are available in rotary, oscillating, push button, roller and plunger types. Using micro switch contacts to provide rapid snap action, speeds of more than 200 contacts per minute have been successfully attained. Electrical contacts are made in fully enclosed, dust-proof, moulded, removable cases. The National Acme Co., 170 East 131st Street, Cleveland, Ohio.



NATIONAL ACME SWITCH

■

Reclosing Fuse Cutout

A fuse cutout, porcelain-housed and with reclosing mechanism entirely in the door. Interchangeable with door of present G-E 50-amp. indicating and drop-out cutouts, making it possible to convert latter into reclosing cutouts by adding new door. Contains two fuse holders. Should first fuse link blow, door is pushed outward at bottom—a positive indication. After a time delay of one second the other fuse holder with its link is connected, restoring service if fault is temporary. Should second fuse blow, complete door drops open and is isolated from circuit. General Electric Company, Schenectady, N. Y.

G.E. FUSE CUTOUT

FA TRADE MARK

Trip-Free

"DUBLBRAK"

CIRCUIT BREAKER

Double Protection

The New FA "DUBLBRAK" Trip-Free Circuit Breaker protects Lighting and Appliance Branch Circuits against sustained overloads or short circuits, when such protection is needed. Also — because of the properly engineered time lag of the thermal element, it protects Branch Circuits against unnecessary and annoying service interruptions.

NOTE THIS SAFETY FEATURE

When a short circuit occurs, the thermal element automatically trips, *regardless of the position of the operating handle.* Furthermore, since the tripping action is always independent of the operating handle, the thermal element will positively remain in the tripped position until the overload or short circuit is cleared up — even if the operating handle were forcibly held in the "ON" position.

The FA "DUBLBRAK" Circuit Breaker is built in single pole units and two and three pole units — in capacities from 6 to 50 amperes. Approved by Underwriters' Laboratories for both AC and DC, 125-volt service. Available January 1, 1938.

Frank Adam

ELECTRIC COMPANY

ST. LOUIS

●

UMI

RELIANCE
MODEL W

● A new synchronous electric time switch of extremely simple, compact, economical, and dependable construction, answering nearly every time switch need with only three modern types. Offers innumerable exclusive features. Heavily constructed. Fully guaranteed.

Compact — outside dimensions are only 7¼ x 4¼ x 3⅞ inches deep. Note, however, that plenty of wiring space is provided and there are four convenient combination knockouts on bottom, sides and back.

See your wholesaler or write for complete descriptive literature

RELIANCE AUTOMATIC LIGHTING CO.
1937 Mead Street Racine, Wis.

MINERALLAC HANGER

Conduit 3/8"—2 1/2"
Cable to 2 1/8" (with Bushings)

MINERALLAC JIFFY CLIP

Sizes from .250" O.D. Tubing to 1¼" conduit.

See your Jobber

New York City Office
Theodore B. Dally
50 Church Street

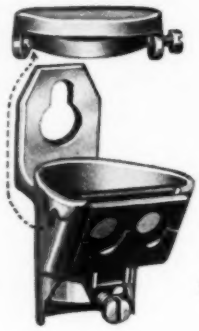
MINERALLAC ELECTRIC CO.
25 N. Peoria St., CHICAGO

EQUIPMENT News

[FROM PAGE 84]

Entrance Cap

This entrance cap for service entrance cable is designed to require the use of only one screw to hold it on. Secured by a pin-like formation on one side and brass screw on the other. Cap accommodates large number of sizes of service entrance cable. The Rattan Manufacturing Co., New Haven, Conn.



RATTAN ENTRANCE CAP

■

Toy Transformer

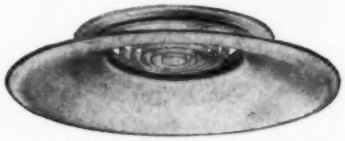
With the vernier voltage control on this line of toy transformers, the secondary current is delivered in extremely fine steps per volt instead of usual one or two-volt steps, which increases the smoothness of operation. Also has a speedometer-type name-plate with arrow indicator dial calibrated to represent train speeds in "miles per hour". A sub-base is provided to insure circulation of air and cool operation. Available in capacities from 35 to 150 watts. Some models have separate 9-volt taps for operation of train whistles and accessory lamps. Large model equipped with automatic circuit breaker. Jefferson Electric Company, Bellwood, Ill.

JEFFERSON TOY TRANSFORMER

■

Ceiling Illuminator

In this ceiling illuminator, louver consists of metal frame for attaching to flush mounting ring. Outer vein of concentric louver is flared spinning designed to permit bulk of reflected light from Permaflector to pass through in the usual way but to intercept outermost rays and reflect them laterally and upwardly to ceiling. Uses 500-watt lamps. Pittsburgh Reflector Company, Oliver Building, Pittsburgh, Pa.



PITTSBURGH REFLECTOR ILLUMINATOR

■

Multi-Breaker

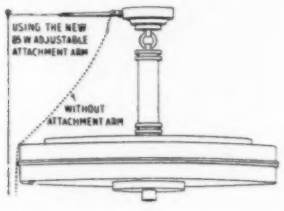
The Type "M" Multi-breaker is designed to meet the demand for smaller, more compact device for service entrance, range or hot water heater circuits and general purpose use. Available for 2 and 3-wire solid neutral with either grounded or insulated neutrals, for 115, 115/230 volts a.c. service. Capacities include 15, 20, 25, 35 and 50 ampere. Tripping action of 3-wire devices is individual but operating handles may be tied together if desired. Box size is 9¼ in. by 5-in. x 3-in. for either flush or surface mounting. Square D Company, Detroit, Michigan.

SQUARE D MULTI-BREAKER

■

Extension Arm

A sliding rod has been made a part of this extension arm for use with Levolier switches and permits extension by several inches. It can be used to advantage in new style fixtures with wide basins as it carries pull cord out away from fixture. Eliminates rubbing and wear on cord and prevents fixture from swaying back and forth when switch is operated. McGill Manufacturing Co., Valparaiso, Ind.



McGILL EXTENSION ARM

How electrical manufacturers can meet 1938's sales problem

—and increase sales and profits

In 1938, manufacturers of electrical products will face an increasingly difficult sales problem—that of winning the support of electrical wholesalers' salesmen.

Though these salesmen's order books will record an estimated $750,000,000 in sales of electrical products—another marked yearly gain—this does not mean that the individual manufacturer's sales through these salesmen will automatically increase in proportion. Other manufacturers—to attain their increased 1938 sales quotas—will be, more strenuously than ever, competing for the support of electrical wholesalers' salesmen.

The individual manufacturer *must* redouble his efforts to sell these salesmen—

on CONTINUING their present support for his line

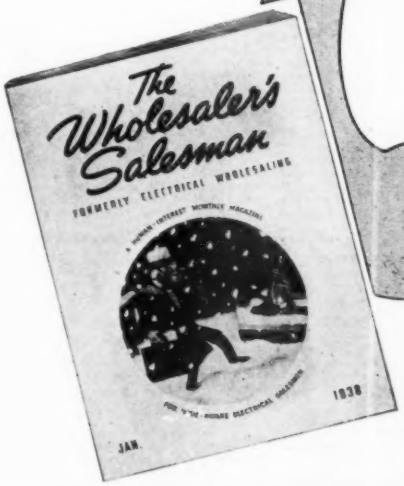
on INCREASING their sales efforts on his line

He must use the most forceful, direct and effective route for solving this sales problem.

And in 1938, that route is

THE WHOLESALER'S SALESMAN

a publication promoting greater sales and profits for the manufacturer and his wholesalers' salesmen



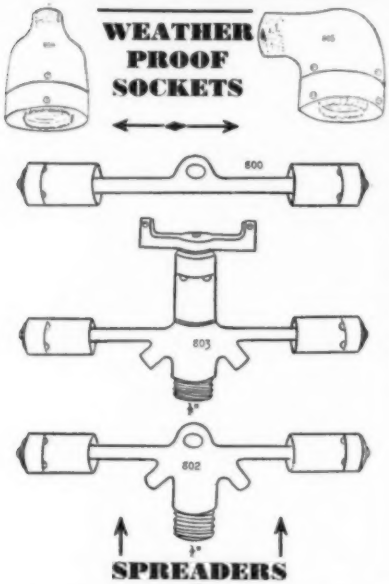
A McGRAW-HILL PUBLICATION

THE WHOLESALER'S SALESMAN

Formerly ELECTRICAL WHOLESALING

330 West 42nd St. New York, N. Y.

★ *The* HARTMAN *Line* ★



Hartman weather proof sockets and spreaders will make the most rigid job for outdoor wiring. No. 803 spreader made for 3-wire circuits.

For information see your jobber or write direct.

B. HARTMAN

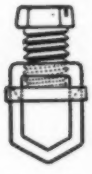
168 Sunset St. Long Beach, Calif.

SIMPLE, ISN'T IT?

ILSCO

SOLDERLESS CONNECTOR

NOTICE: The *triangular wedge* formed by the tang and V-bottom collar, which forces the wire into a *solid mesh*—



NO set-screw contact . . .
NO flattening or separating of wires . . .
NO limitation to one size wire . .
NO shearing effect whatsoever . .
NO special tools required to make connection . . .

NO need for you to search any longer for the PERFECT Solderless Connector—WE HAVE IT!

Ilsco solder lugs show the size of the largest wire they will take.

FREE—A large display board, containing mounted samples of ILSCO lugs. Sent upon request.

ILSCO COPPER TUBE & PRODUCTS, INC.
5629 Madison Road. Cincinnati, Ohio

EQUIPMENT News

[FROM PAGE 86]

Adjustable Floodlight

This adjustable floodlight unit has telescopic arm providing vertical arc adjustment of 37-deg. in addition to complete circle adjustment horizontally. Wiring is concealed for weather protection. Removable cover at top of arm is provided to expose socket terminal. Wiring is done without removal of socket. All strain on wiring is prevented by wire clips. Revere Electric Co., 752 W. Jackson Blvd., Chicago, Ill.

REVERE ADJUSTABLE FLOODLIGHT

■

Lighting Unit

The Aurora lighting unit allows use of silvered bowl lamp or standard Mazda lamp. Wide light distribution of this Sight-Craft model makes it desirable for low ceilings. Aluminum hemisphere inserted in bottom of ivory-finished Vitrolux enamel reflector permits small amount of light to trickle out around edges. Smoot-Holman Company, Inglewood, California.

SMOOT-HOLMAN AURORA UNIT

The easiest way to get ahead in electricity—

through the other man's experience as found in books

Whatever "getting ahead" means to you as an individual, there is no principle so important as backing up your brain with the other man's experience. Why spend time and effort to find out what has already been learned and put down for all to see in books? Here, for instance, are all the results of a rich experience in every stage of wiring, installation and contracting work gathered and set down for you in

Terrell Croft's

AMERICAN ELECTRICIANS' LIBRARY

(6 volumes—over 2,000 pages—fully illustrated)

In six really magnificent volumes this library gives the most thorough, most complete and easiest-to-understand treatment of the more specialized phases of electrical practice in print today.

"How" and "why" for Maintenance Men

The books show the best ways to make installations for every type of conduit wiring job—they tell how to handle every kind of lighting and switch problem—they give tips on short-cuts for saving time on routine jobs—they show the quickest and surest methods of locating and remedying circuit troubles. Alternating current armature winding, electrical machinery control diagrams and machinery erection are some of the things covered in detail.

Diagrams

In all, these books contain more than 1,000 clear, easy to follow diagrams, with wiring instructions written in simple language. It is unnecessary to tell you how valuable is this one feature alone.

Small monthly payments

You may examine these books free for 10 days by sending the coupon below, filled out. In addition, if you decide to keep the books you have the privilege of paying for them in easy monthly installments while you use the books. Make sure you are not passing up your best bet for getting ahead. Mail the coupon today.

FREE EXAMINATION COUPON

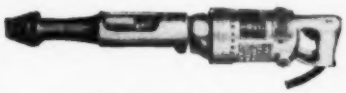
McGraw-Hill Book Co., Inc.
330 W. 42nd St., New York, N. Y.

Send me Croft's American Electricians' Library, 6 volumes, for 10 days' free examination. If I find the books satisfactory, I will send you $1.50 in 10 days, and $2.00 a month until $17.50 has been paid. Otherwise I will return the books postpaid.

Signature .....
Address .....
City and State .....
Firm or Employer .....
Position EC-12-37
(Books sent on approval in U. S. and Canada only.)

Hammer and Drill

"Do-All" is a combination electric hammer and drill for drilling holes in concrete brick and stone. Star drill fits loosely in socket. Tool retainer made of molded rubber, fits over nose of hammer and holds cutting tool in place with enough play for rapid drilling or cutting. Keeps grit from getting into socket in overhead drilling. Wodack Electric Tool Corp., 4627 West Huron St., Chicago, Ill.



WODACK HAMMER AND DRILL

■

Outdoor Floodlight

An all purpose weatherproof outdoor floodlight used in lighting up an area of approximately 50 feet in diameter. Recommended for use in yards, lawns, rock gardens, small signs. Furnished with adjustable mounting bracket that can be inserted in ground or mounted with wood screws. Available in 60 and 100-watt. Electric Distributing Company, 126 North Union Ave., Chicago, Ill.

ELECTRIC DISTRIBUTING OMNILITE

■

Two-Stage Pump

A two-stage pump and motor built together to operate against heads up to 500-ft. For portable and semi-portable as well as stationary service. No special foundation required. Pump is complete and can be mounted in any convenient horizontal, vertical or angular position. Consists of a two-stage centrifugal pump, with enclosed bronze impellers, mounted directly on shaft of splash-proof motor. Impellers for two stages are placed back to back. Fairbanks, Morse & Co., Chicago, Ill.

FAIRBANKS, MORSE PUMP

Only 73 copies left!

OF THE

MASTER ELECTRICAL SPECIFICATION

NUMBER OF

ELECTRICAL CONTRACTING

Published in June, 1936—now widely adopted as a text book for planning adequate wiring

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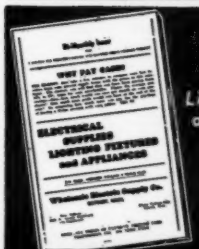

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